

Addendum No. 2 to  
May 2006 Health and Safety Plan  
Biorecirculation Pilot Test at Former  
Bldg. 1/36

**Boeing Realty Corporation  
Former C-6 Facility  
19503 South Normandie Avenue  
Los Angeles, California**

May 4, 2007

*Prepared for:*

Boeing Realty Corporation  
4501 Conant St.  
Building 851, M/C D851-0097  
Long Beach, CA 90808

*Prepared by:*

**CDM**

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Irvine, California 92612

The information contained in the document titled "Addendum No.3 to May 2006 Health and Safety Plan, Biorecirculation Pilot Test at Former Bldg. 1/36" for site "Boeing Realty Corporation Former C-6 Facility, Los Angeles, California", dated May 4, 2007, has received appropriate technical review and approval. This acknowledgement is made in lieu of all warranties, either expressed or implied.

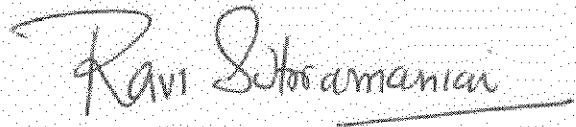
Prepared by:

Handwritten signature of Jeff Bamer in black ink, with the date "04 MAY 06" written above it.

Jeff Bamer  
Project Engineer

Handwritten signature of Joseph C. Leslie in black ink.

Joseph Leslie  
Regional Health and Safety Manager

Handwritten signature of Ravi Subramanian in black ink.

Ravi Subramanian, P.E.  
Principal and Project Manager

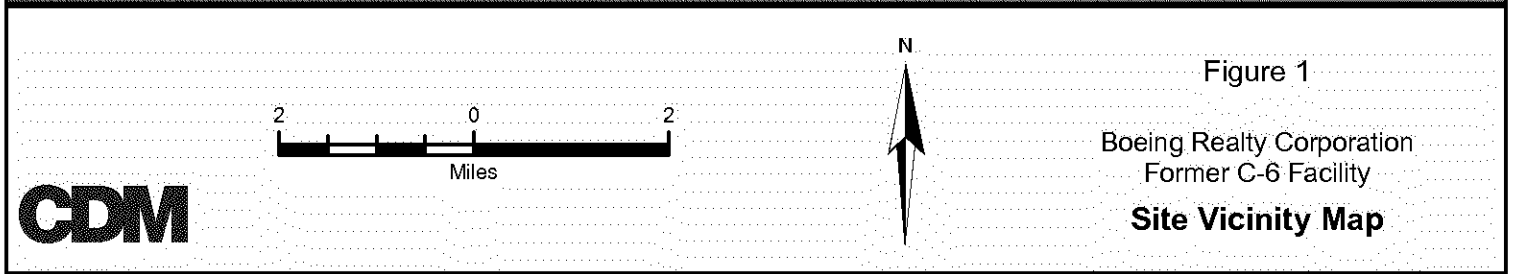
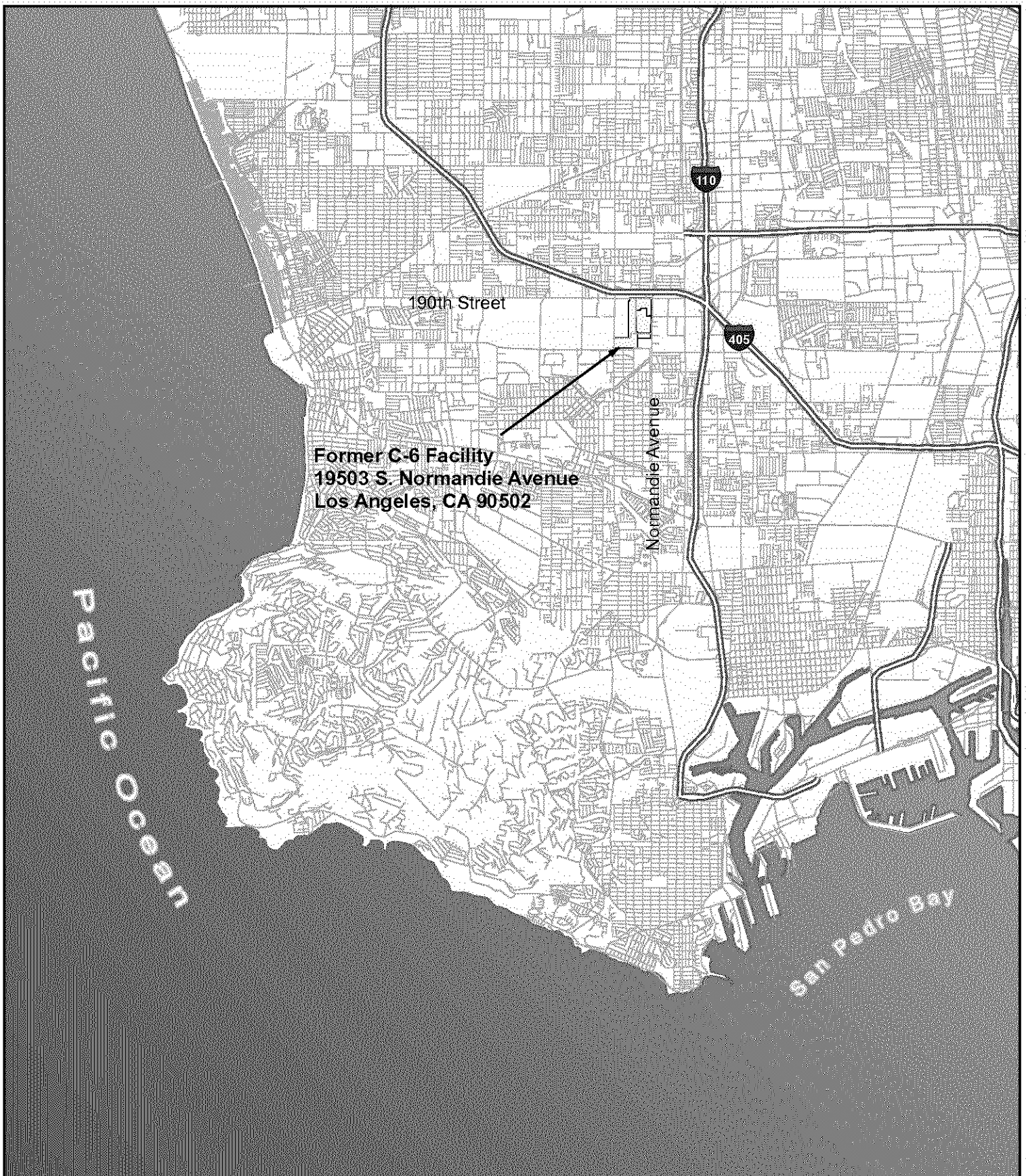
**HEALTH AND SAFETY PLAN**

CDM Constructors Inc.

**Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36****TABLE OF CONTENTS**

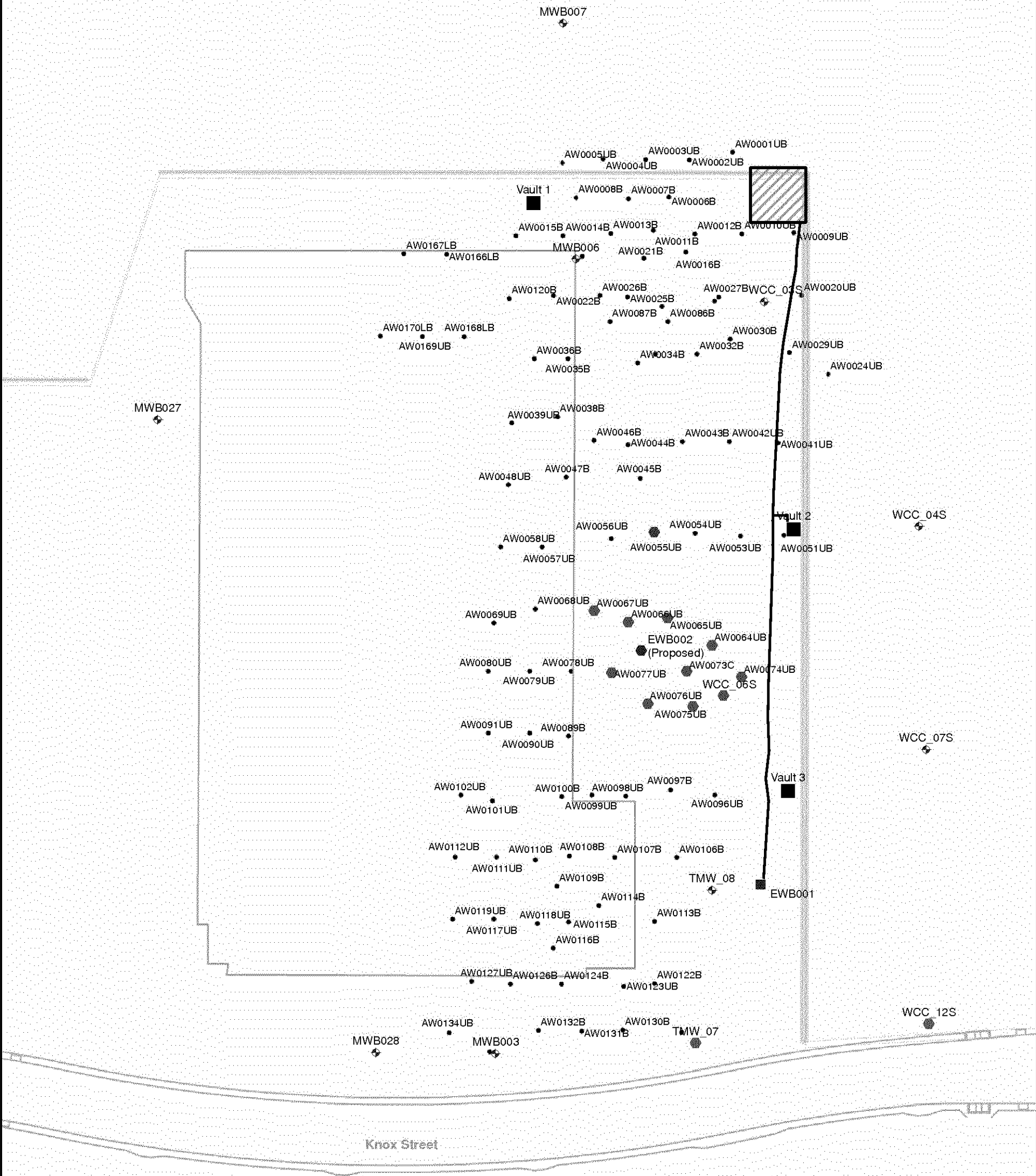
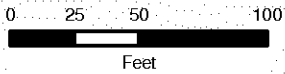
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<b>HEALTH AND SAFETY PLAN</b>		<b>CDM Constructors Inc.</b>													
<b>INTRODUCTION</b>															
PROJECT NAME : <b>Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36</b>	WORK ASSIGNMENT NO.	REGION: N.W.													
JOB SITE ADDRESS: <b>1451 W. Knox Street, Los Angeles, CA 90501</b>	CLIENT: <b>Boeing Realty Corporation</b>														
SITE CONTACT: <b>Dennis Carlson, Boeing Realty Corporation</b>	CLIENT CONTACT: <b>Robert P. Scott, Boeing Realty Corporation</b>														
PHONE NO.: <b>818-535-7438</b>	PHONE NO.: <b>(562) 586-4533</b>														
( XX ) AMENDMENT NO. <b>2</b> TO EXISTING APPROVED HASP - DATE EXISTING APPROVED HASP <b>May 4, 2006</b>															
<b>OBJECTIVES OF FIELD WORK:</b> <ol style="list-style-type: none"> <li>1. Perform wellhead modifications including installation of vault and downhole well pumps (ICS and JHA).</li> <li>2. Drill, complete, develop new well EWB002 (CDM/WDC).</li> <li>3. Sawcut and trench for vault and place piping/conduits in trench, pressure test piping, working around existing remediation piping (ICS).</li> <li>4. Manage IDW from well installation and trenching activities (Waste Mgmt Sub).</li> <li>5. Move Bldg 3 injection system Connex box and place at site, install solid mixing equipment trailer equipment inside compound using crane, perform aboveground mechanical modifications (piping, valves, tanks) to the existing compound, Connex box and solid mixing trailer (JHA).</li> <li>6. Backfill trench, replace paving and striping, and grout vault openings (ICS).</li> <li>7. Survey location of constructed items (KDM).</li> <li>8. Perform electrical connections and wire in new instrumentation (CDM).</li> <li>9. Shakedown, operation and maintenance of groundwater treatment system (CDM/JHA) including: injection of electron donors (60% Sodium Lactate, Whey Powder or Newman Zone); one or two-time injection of non-pathogenic chlorinated ethene-degrading Dehalococcoides ethenogenes culture (Shaw's SDC-9<sup>TM</sup> culture, or SiREM's KB-1<sup>TM</sup>); and periodic injection of low concentrations of biofouling control chemicals (chlorine dioxide [CAS 10049-04-4] and/or hypochlorite [CAS 7778-54-3] or a weak organic acid [i.e., LBA cleaner]).</li> </ol>		<b>TYPE: Check as many as applicable</b> <table> <tr> <td><input checked="" type="checkbox"/> Active</td> <td><input type="checkbox"/> Landfill</td> <td><input type="checkbox"/> Unknown</td> </tr> <tr> <td><input type="checkbox"/> Inactive</td> <td><input type="checkbox"/> Uncontrolled</td> <td><input type="checkbox"/> Military</td> </tr> <tr> <td><input checked="" type="checkbox"/> Secure</td> <td><input checked="" type="checkbox"/> Industrial</td> <td><input type="checkbox"/> Other</td> </tr> </table> <b>Specify:</b> <table> <tr> <td><input type="checkbox"/> Unsecure</td> <td><input type="checkbox"/> Recovery</td> </tr> <tr> <td><input checked="" type="checkbox"/> Enclosed space</td> <td><input checked="" type="checkbox"/> Well Field (Monitoring Wells)</td> </tr> </table> <b>Note:</b> Site is anticipated to have heavy truck traffic from April to November 2007 (Approximately 100 to 200 trucks from 6:00 AM to 12:00 Midnight)	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> Landfill	<input type="checkbox"/> Unknown	<input type="checkbox"/> Inactive	<input type="checkbox"/> Uncontrolled	<input type="checkbox"/> Military	<input checked="" type="checkbox"/> Secure	<input checked="" type="checkbox"/> Industrial	<input type="checkbox"/> Other	<input type="checkbox"/> Unsecure	<input type="checkbox"/> Recovery	<input checked="" type="checkbox"/> Enclosed space	<input checked="" type="checkbox"/> Well Field (Monitoring Wells)
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<input checked="" type="checkbox"/> Enclosed space	<input checked="" type="checkbox"/> Well Field (Monitoring Wells)														
<b>DESCRIPTION AND FEATURES:</b> The BRC Former C-6 property is bounded by a railroad right-of-way and Normandie Avenue to the east, 190 <sup>th</sup> Street to the north, the former location of International Light Metals to the west, and the former location of Montrose Chemical to the south (Figure 1). The surrounding area consists primarily of industrial and commercial properties with some residential developments. The McDonnell Douglas Corporation operated an aerospace manufacturing facility on the site since the 1940's. All of the original above ground facility structures were demolished, and the site now consists of new warehouse buildings with truck loading docks and office space. Figure 2 is a plan of the Former Building 1/36 area of the Site along with the existing wells and the treatment compound area at the site.															
SURROUNDING POPULATION: <input type="checkbox"/> Residential <input checked="" type="checkbox"/> <b>Industrial</b> <input type="checkbox"/> Rural <input checked="" type="checkbox"/> <b>Urban</b> <input type="checkbox"/> OTHER:															
Prepared by: <b>Jeff Bamer, Project Engineer/H&amp;S Coordinator</b>	Date: <b>4/06/2006</b>														
SHSO Signature:	Date:														
HSM Signature:	Date:														



- NOTE:
- 1. Existing well vaults and conveyance piping, as shown, will be used to transport extracted groundwater to the treatment compound and amended water back to select amendment wells.
  - 2. A limited subset of the existing amendment and monitoring wells will be used for the pilot study.

PARCEL A



March 5, 2007



Legend

- Property Boundary
- Parcel Boundary
- Existing Compound
- Existing Vault
- B-Sand Extraction Well
- B-Sand Monitoring Well
- B-Sand Amendment Well

- Existing Spare Electrical Conduit and Water Piping
- Group A Amendment Well (Upper B-Sand)
- Proposed Group B Monitoring Well (Upper B-Sand)
- Group B Monitoring Well ((5) Upper B-Sand and (1) C-Sand)
- Group C Downgradient Well (B-Sand)
- Group D Upgradient Well (Upper B-Sand)

Boeing Realty Corporation  
Former C-6 Facility  
*Proposed Biorecirculation  
Pilot Study Well Layout*

Figure 2

<b>HEALTH AND SAFETY PLAN</b>		<b>CDM Constructors Inc.</b>
<b>Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36</b>		
<b>HISTORY AND WORK ZONES</b>		
<b>HISTORY:</b> Prior site history has contributed to groundwater contamination at the site. Two primary source areas have been identified at the Site (Former Buildings 2 and 1/36). The primary VOCs in the Building 2 and Building 1/36 areas vary slightly. The Building 2 primary VOCs include trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), and chloroform. The Building 1/36 primary VOCs include TCE, 1,1-DCE, methyl ethyl ketone (MEK [2-butanone]), toluene, and 1,1,1-trichloroethane (1,1,1-TCA). Site work will include the generation of soil, groundwater, and other investigation-derived waste (IDW) contaminated with chlorinated VOCs.		
<b>WASTE TYPES:</b> ( ) Solid    ( ) Sludge    (X) Liquids    (X) Soils (see note on page 10)		
<b>HAZARDS OF CONCERN:</b> (X ) Heat/Cold Stress                      (X ) Noise (X) Volatile Organic Chemicals    (X) Slips, Trips, & Falls (X) Motorized Traffic (X) Heavy Machinery                      (X) Other specify: Trenches, electrical  <b>WASTE CHARACTERISTICS:</b> (X) Toxic (X) Volatile (X) Carcinogenic  <b>ADDITIONAL GUIDELINES:</b> Additional work guidelines are attached for the following tasks: housekeeping, manual material handling, electrical safety, lockout/tagout procedures, excavations, ladders, tools and power equipment, heat stress, working around heavy equipment, flammable and combustible materials, working safely around drill equipment, hazardous waste site controls, hazardous waste site decontamination, traffic and work zone safety, and cell phone safety. These guidelines shall be followed during all site work and all workers should be familiar with any guidelines relevant to their work activities.  <b>ALCOHOL &amp; DRUG POLICY:</b> CDM policy strictly prohibits the unlawful manufacture, distribution, dispensation, possession, or use of illegal drugs, alcohol or controlled substances by any employee on or near the firm's premises or vehicles, during working hours or before reporting to work.  Violation of this policy will result in appropriate discipline, up to and including immediate discharge. Employees are cautioned that discipline under this policy may include satisfactory participation in a substance abuse assistance or rehabilitation program as a condition of continued employment.  Substance abuse assistance and rehabilitation programs are available through the firm's Employee Assistance Program (EAP). Employees with substance abuse problems are strongly encouraged to participate in these programs.  A complete copy of the CDM policy on Drugs and alcohol is located in the CDM Health and safety Manual to be located at the site with the CDM superintendent.		<b>SITE SPECIFIC SAFETY:</b> The site safety plan will be used as a companion to the CDM Safety Manual. A copy of the manual will be maintained on the project site at all times by the CDM superintendent / SHSO. This HASP is also accompanied by AHAs (attached).  <b>TRAINING:</b> Personnel inside any work zone at the site (including the CRZ) shall be in compliance with all training and medical surveillance specified in the CDM Safety Manual, including current HAZWOPER training (as per 29 CFR) and medical surveillance.  <b>INJURY AND ILLNESS PREVENTION:</b> CDM's purpose for the Health and Safety Program is the reduction of the number of illnesses and injuries to an absolute minimum. The firm's goal is not merely to keep pace with, but to surpass industry safety standards, with an ultimate goal of zero accidents and injuries.  To achieve these objectives, CDM's corporate strategy includes the following elements: <ul style="list-style-type: none"> <li>• Identification and employment of quality employees.</li> <li>• Quality, consistent, and ongoing health and safety training programs. Identification and appraisal of accident and loss producing conditions and practices.</li> <li>• Communication of accident and loss control intervention to all layers of management.</li> <li>• Assigning accountability and responsibility to all employees for implementation and maintenance of methods, procedures, and practices involved with the Health and Safety Program.</li> <li>• Measurement and evaluation of the effectiveness of the accident and loss control system.</li> </ul> A complete copy of CDM's policy regarding injury and illness prevention can be found in Section 3 of the Health and Safety Manual to be located at the site with the CDM superintendent.

<b>HEALTH AND SAFETY PLAN</b> <b>Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36</b>	<b>CDM Constructors Inc.</b>
<b>HISTORY AND WORK ZONES (Continued)</b>	
<p><b>WORK ZONES:</b></p> <p>Work zones(WZ) will be established for all tasks associated with this project work. Because most of the work areas will change based on the tasks to be performed , work zones will be established and periodically re-established at each location. Work zones may encompass the site as shown on the site plan. Protective clothing and equipment, as described on Page 12 are to be worn by all personnel working within the restricted access WZ.</p> <p><b>Exclusion Zone (EZ):</b></p> <ul style="list-style-type: none"> <li>• EZ for Task 4 (IDW management) will be a 10-foot radius radius around each work area.</li> <li>• EZ for Tasks 9 (O&amp;M) will include the entire Connex box or remediation compound whenever there is a break in process piping (e.g. sampling or maintenance), but otherwise not have an EZ.</li> <li>• Drilling-Related Activities (Task 2): EZ around the drill rig will be at least 1.5 times the height of the mast. Only personnel necessary for the immediate task being performed should be inside the exclusion zone.</li> <li>• No EZ is anticipated for trenching-related or other non-intrusive activities (Tasks 1, 3, 5, 6, 7, and 8), because extensive site soil remediation has previously been conducted at the site and the trench materials are expected to be non-native fill material. In the event impacted soils are encountered, the EZ will include all areas where potentially contaminated materials are present, excavated, or handled, and where contaminated equipment or personnel may travel. At a minimum the EZ will consist of the entire area for the excavation and stockpiling and soil processing areas. The perimeter of all open trenches will be defined with temporary fencing and caution tape. Trench plates will be used as necessary to cover open trenches.</li> </ul> <p>The Contamination Reduction Zone (CRZ) is sometimes referred to as the decontamination area, or "decon area". The CRZ also serves as the point of entrance and exit between the exclusion and support zones. One central CRZ will be established in the general work area and used for all Level D activities. If Level C is worn, a CRZ will be established immediately adjacent to the EZ and lined with plastic for all equipment and personnel decontamination, to the extent possible. All protective equipment will be removed in the CRZ.</p> <p>The Support Zone (SZ) is typically located on the outermost part of the Site in a clean or non contaminated area. Support equipment is located in this zone. Potentially contaminated garments, equipment, and samples are permitted in this zone only after they have been decontaminated or properly packaged for disposal. One central support zone will be selected, which will be the staging area for contractor's field trailer, heavy equipment and field personnel parking (as needed). Unauthorized personnel and the general public will not be allowed within any work zones, including the support zone.</p>	



HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36					CDM Constructors Inc.
HAZARDOUS MATERIAL SUMMARY					
CHEMICALS	SOLIDS	SLUDGES	SOLVENTS	OILS	OTHER
<b>Gasoline</b> <b>Diesel</b> <b>PVC glue and primer</b> <b>Pipe lubricant</b>  <b>Electron donor solutions (60% Sodium Lactate, Whey Powder or Newman Zone); Bioaugmentation Cultures (Shaw's SDC-9™ culture, or SiREM's KB-1™); Biofouling control chemicals (chlorine dioxide [CAS 10049-04-4] and/or hypochlorite [CAS 7778-54-3] or a weak organic acid [i.e., LBA cleaner])</b>	<b>Drill cuttings</b>				<b>Groundwater impacted with VOCs generated from sampling, well installation, and aquifer testing</b>  <b>Decontamination fluids and materials</b>

HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36	CDM Constructors Inc.
HAZARDOUS MATERIAL SUMMARY (contd.)	
<p><b>PROPER STORAGE OF HAZARDOUS MATERIALS:</b></p> <p><u>Gasoline and Diesel</u> will be stored in approved metal safety type cans only.</p> <p><u>PVC Glue &amp; Primer</u> will be stored in their original containers, and in accordance with Flammable materials storage requirements.</p> <p><u>Pipe Lubricant</u> will be properly stored according to the manufacturer's specifications.</p> <p><u>All materials (electron donor solutions, cultures, biofouling chemicals, etc) brought onto the site will be accompanied by an MSDS; NO EXCEPTIONS. MSDS sheets for the site will be stored at the site and updated regularly. Furthermore, all chemicals will be handled in a manner consistent with the MSDS. All site workers will be aware of MSDS locations for access during emergencies.</u></p> <p><u>All investigation derived waste (IDW), such as purged groundwater, decontamination water and related-materials, soil cuttings from drilling operations, etc, will be containerized and managed as hazardous waste pending waste profiling and disposal.</u></p>	
FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium <b>(X) Low</b> ( ) Unknown	
BACKGROUND REVIEW: (X) COMPLETE ( ) INCOMPLETE	

HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36					CDM Constructors Inc.	
HAZARDS ASSOCIATED WITH KNOWN CONTAMINANTS						
KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (Media)	PEL/TLV ppm or mg/m <sup>3</sup>	IDLH ppm or mg/m <sup>3</sup>	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTO- IONIZATION POTENTIAL
Trichloroethene	490 mg/Kg (S) 29 mg/L (GW)	25 ppm	1,000 ppm	82 ppm	Vertigo, visual disturbance, headache, drowsiness	9.45
1,1,1-Trichloroethane	300 mg/Kg (S) 110 mg/L (GW)	350 ppm	700 ppm	400 ppm	Headache, CNS depression, loss of balance, eye irritation	11.00
1,1-Dichloroethene	390 mg/Kg (S) 88 mg/L (GW)	1 ppm	>500 ppm	1.1 ppm	No acute effects	<11.0
Benzene	0.39 mg/L (GW)	0.5 ppm	500 ppm	61 ppm	Eye & nose irritation, headache, giddiness, nausea, fatigue	9.25
Methyl Ethyl Ketone	21 mg/L (GW)	200 ppm	3,000 ppm	5.5 ppm	Irritated eyes, dizziness, vomiting	9.53
Methyl Isobutyl Ketone	100 mg/L (GW)	50 ppm	500 ppm	0.88 ppm	Irritated eyes, nose & throat, narcosis, headache	9.30
Toluene	140 mg/L (GW)	50 ppm	500 ppm	1.7 ppm	Fatigue, confusion, euphoria, dizziness, headache, tears	8.82
NA=Not Available NE=None Established U=Unknown	SW=Surface Water GW=Groundwater A=Air W=Waste	SU=Surficial I=Intermediate F=Floridan		SD=Sediment T=Tailings SL=Sludge D=Drums	TK=Tanks L=Lagoon S=Soil (see note below) OFF=Offsite	
TLV – Threshold Limit Value, <i>Threshold Limit Values for Chemical Substances and Physical Agents</i> , American Conference of Governmental Industrial Hygienists PEL – Permissible Exposure Limit, 29 CFR (Code of Federal Regulations) Part 1910, Subpart Z IDLH – Immediately Dangerous to Life or Health Concentrations – <i>NIOSH Pocket Guide to Chemical Hazards</i> , National Institute for Occupational Safety and Health						

(See note on following page regarding soil concentrations)

HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36					CDM Constructors Inc.	
HAZARDS ASSOCIATED WITH KNOWN CONTAMINANTS (CONTINUED)						
KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (Media)	PEL/TLV ppm or mg/m <sup>3</sup>	IDLH ppm or mg/m <sup>3</sup>	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTO- IONIZATION POTENTIAL
Diesel Fuel	20,000 mg/Kg (S)	100 mg/m3	NE	10 ppm	Vomiting, diarrhea, insomnia, dizziness, headache	NA
PCBs	9.8 mg/Kg (S)	500 µg/m3	5 mg/m3	Mist	Irritated eyes, chloracne	Mist
Arsenic	350 mg/Kg (S)	10 µg/m3	5 mg/m3	Dust	Nasal ulcers, fever, bronchitis, melanosis, peripheral neuropathy	Dust
Chromium compounds	491 mg/Kg (S) – Hexavalent chromium	1 µg of Cr(VI) / m3	15 mg of Cr(VI) / m3	Dust	Lung damage, skin sensitization	Dust
Lead	1790 mg/Kg (S)	50 µg/m3	100 mg/m3	Dust	Fatigue, pallor, colic, insomnia	Dust
NA=Not Available NE=None Established U=Unknown	SW=Surface Water GW=Groundwater A=Air W=Waste	SU=Surficial I=Intermediate F=Floridan	SD=Sediment T=Tailings SL=Sludge D=Drums	TK=Tanks L=Lagoon S=Soil (see note below) OFF=Offsite		
TLV – Threshold Limit Value, <i>Threshold Limit Values for Chemical Substances and Physical Agents</i> , American Conference of Governmental Industrial Hygienists PEL – Permissible Exposure Limit, 29 CFR (Code of Federal Regulations) Part 1910, Subpart Z IDLH – Immediately Dangerous to Life or Health Concentrations – <i>NIOSH Pocket Guide to Chemical Hazards</i> , National Institute for Occupational Safety and Health						

**Note: Site operations, with the exception of drilling (task 2), are not expected to encounter any contaminated soil.** All trenching should be shallow (less than 4 feet below ground surface) and should only encounter non-native clean fill. However, if site personnel encounter potentially contaminated soils during drilling or any other intrusive site work, they should take preventative measures to limit exposure. This shall include donning Tyvek coveralls and other PPE as needed to minimize transport of and exposure to potentially contaminated soil. In the event of exposure, proper decontamination procedures must be undertaken as soon as possible (see page 16 of this plan for decontamination procedures), and the appropriate HSM notified.

HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36				CDM Constructors Inc.		
FIELD ACTIVITIES						
TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION	Type	Primary	Contingency	HAZARD/ ACTIVITY SCHEDULE		
1) Wellhead modifications	Intrusive	Level D	Level C	Hi	Med XXX	Low
2) Drill, complete, develop new well EWB002	Intrusive	Level D	Level C	Hi	Med XXX	Low
3) Sawcut and excavate for trench (up to 4' bgs) and vault, place piping/conduits in trench, pressure test piping, working around existing remediation piping	Intrusive	Level D	Level C	Hi	Med XXX	Low
4) Manage IDW from well installation and trenching activities	Intrusive	Level D	Level C	Hi	Med XXX	Low
5) Move Bldg 3 injection system Connex box and place at site, install solid mixing equipment trailer equipment inside compound using crane, perform aboveground mechanical modifications (piping, valves, tanks) to the existing compound, Connex box and solid mixing trailer	Intrusive	Level D	Level C	Hi	Med XXX	Low
6) Backfill trench, replace paving and striping, and grout vault openings	Non-intrusive	Level D	Level C	Hi	Med XXX	Low
7) Survey location of constructed items	Non-intrusive	Level D	Level D	Hi	Med	Low XXX
8) Perform electrical connections and wire in new instrumentation	Non-intrusive	Level D	Level D	Hi	Med XXX	Low
9) Shakedown, operation and maintenance of groundwater treatment system	Intrusive	Level D	Level C	Hi	Med XXX	Low

HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36		CDM Constructors Inc.	
<b>PROTECTIVE EQUIPMENT</b>			
<b>Primary: All Tasks</b>  <b>LEVEL D – Modified</b>		<b>Contingency: All Tasks (except 7 and 8 – should not be necessary for those non-intrusive tasks)</b>  <b>LEVEL C – Modified</b>	
<b>Respiratory: (X ) Not Needed</b> ( ) SCBA, Airline ( ) APR ( ) Cartridge: ( ) Escape Mask ( ) Other	<b>Prot. Clothing: ( ) Not Needed</b> <b>(X) Tyvek Coverall (as needed and for Tasks 2 and 4)</b> <b>(X) Cloth Coverall (otherwise)</b> <b>(X) Traffic/high visibility vest</b>	<b>Respiratory: ( ) Not Needed</b> ( ) SCBA, Airline <b>(X) APR (Full face preferable)</b> <b>(X) Cartridge: Organic Vapor/HEPA/Acid Gases</b> ( ) Escape Mask ( ) Other	<b>Prot. Clothing: ( ) Not Needed</b> <b>(X) Tyvek Coverall</b> ( ) Cloth Coverall <b>(X) Traffic/high visibility vest</b>
<b>Head and Eye: ( ) Not Needed</b> <b>(X ) Safety Glasses</b> ( ) Face Shield ( ) Goggles <b>(X) Hard Hat (all Tasks except 10)</b> ( ) Other	<b>Gloves: (X) Not Needed for Task 7 only</b> <b>(X) Undergloves (Type: nitrile)</b> <b>(X) Gloves (Type: Leather as needed or nitrile)</b> ( ) Overgloves	<b>Head and Eye: ( ) Not Needed</b> <b>(X) Safety Glasses</b> ( ) Face Shield ( ) Goggles <b>(X) Hard Hat (all Tasks except 10)</b> ( ) Other	<b>Gloves: ( ) Not Needed</b> <b>(X) Undergloves (Type: nitrile)</b> <b>(X) Gloves (Type: Leather as needed or nitrile)</b> ( ) Overgloves
<b>Boots: ( ) Not Needed</b> <b>(X) Boots: <u>Leather work boots with steel toes</u></b> ( ) Overboots ( ) Rubber	( ) Other – specify below: <b>Hearing Protection as needed</b>  <u><i>SHSO can upgrade or downgrade PPE requirements, as conditions warrant.</i></u>	<b>Boots: ( ) Not Needed</b> <b>(X) Boots: <u>Leather work boots with steel toes</u></b> ( ) Overboots ( ) Rubber	( ) Other - specify below: <b>Hearing Protection as needed</b>  <u><i>SHSO can upgrade or downgrade PPE requirements, as conditions warrant.</i></u>

HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36			CDM Constructors Inc.
MONITORING EQUIPMENT			
INSTRUMENT	TASK	ACTION GUIDELINES	COMMENTS (Includes schedules of use)
Combustible Gas Indicator	All Excavation	0-10% LEL No explosion hazard 10-25% LEL Potential explosion hazard; notify SHSO. <b>&gt;25% LEL Explosion hazard; interrupt task/evacuate</b> 21.0% O <sub>2</sub> Oxygen normal <b>&lt;19.5% O<sub>2</sub> Interrupt task/evacuate</b>	<b>Contractor will take readings prior to entering an excavation, trench or if augering is being conducted, to determine if flammable vapors, oxygen deficiency or other hazards exist. Continue monitoring during all excavation work.</b>
Radiation Survey Meter			(X) Not Needed
Photo Ionization Detector	All intrusive tasks	Monitor VOC levels in breathing zones. Background – 1 ppm: Level D 1 – 5: Level D and use gas detector tubes 5 – 50 ppm: Level C <b>&gt; 50 ppm: Exit exclusion zone</b>	<b>Use PID with 11 eV lamp (or greater) to improve detection of chlorinated solvent compounds.</b>
Flame Ionization Detector Type : _			(X) Not Needed
Detector Tubes/Monitox  Type		Use gas detector tubes as needed (see above) to test for presence of benzene and 1,1-dichloroethene. Use Level C if detections are made above the PEL for each compound (see page 9). If full-face respirators are used, exit the exclusion zone if concentrations are 10 times the PEL. If half-face respirators are used, exit if concentrations are 5 times the PEL.	<b>May need to use trichloroethene gas detector tube to detect 1,1-dichloroethene.</b>
Respirable Dust Monitor  Type <u>Visual Observation and Mini-Ram PDM 3</u>		Site workers shall employ engineering controls and best management practices to reduce any observed visible dust, especially during drilling operations (tasks 2 and 4). Periodically, site workers shall use Mini-Ram and air surveillance monitoring as described on Page 14. Engineering controls are also summarized on Page 14.	<b>See note regarding soil contamination on page 10.</b>

**AIR SURVEILLANCE PROCEDURES**

Real-time monitoring for airborne dust will be performed during all intrusive activities using a Mini-Ram PDM 3 or comparable. Monitoring will be conducted in or near the breathing zones of site personnel, at the perimeter of the Work Zone and at the perimeter of the property if appropriate based on airborne dust concentrations exceeding Work Zone perimeter action limits. Dust monitoring surveys outside of the Work Zone will be conducted as/if necessary during the initial phase of excavation if visible dust is present and after that, at a frequency based on site conditions.

The action levels for PPE upgrades are:

< 1mg/ m3 dust - Level D

> 1mg/ m3 dust\* sustained for 1 minute - Level C

- 2 mg/ m3 sustained for 1 minute – stop work, apply water to materials being handled and or haul roads, when dust levels drop below the action level , re-start work and continuous monitor for 30 minutes if dust levels remain below 2 mg/m3, monitoring frequency and dust control methods will return to normal.

The action levels for the Work Zone perimeter are:

< 1 mg/ m3 dust - continue routine application of dust control methods

> 2 mg/ m3 dust sustained for 1 minute - stop work, apply water to materials being handled and or haul roads, move to project perimeter and make measurements upwind and downwind, continue monitoring at project perimeter until dust levels fall below 1 mg/m3 and then return to Work Zone perimeter, when dust levels drop below action level of 1 mg/m3 at Work Zone perimeter, re-start work and continuous monitor for 30 minutes, if dust levels remain below 1 mg/ m3, monitoring frequency and dust control methods will return to normal. If it is discovered that the Work Zone perimeter action limit does not protect against dust excursions at the project perimeter, reduce the Work Zone action limit by 25%.



**BIOLOGICAL HAZARDS (As applicable)**

The biological hazards that site personnel may encounter are animal bites, insect stings and contact with local flora.

**Bites and Stings**

Animal bites and insect stings are usually nuisances (i.e. localized swelling, itching, and minor pain) that can be handled with first-aid treatments. The bites of certain poisonous snakes, insects and spiders contain sufficient poison to warrant medical attention. Intentional handling of insects, and animals is prohibited. There are diseases that can be transmitted by insect and animal bites. Examples are Rocky Mountain spotted fever, Lyme disease (tick), rabies (mainly dogs, skunks and foxes) and equine encephalitis (mosquito). The greatest hazard and most common cause of fatalities from animal bites, particularly from bees, wasps, and spiders, is a sensitivity reaction. Anaphylactic shock due to stings can lead to severe reactions in the circulatory, respiratory, and central nervous systems, which can also result in death.

Lyme disease is spread primarily by a very small tick -- the deer tick. It can be found near wooded areas, tall grass and brush. Although the disease is rarely fatal, it can cause flu-like symptoms, arthritis, heart arrhythmia's, facial palsy, severe headaches, and loss of sensation. Protection against the tick consists of wearing clothing that covers the whole body, tucking pant legs into boots or socks and tucking a long-sleeve shirt into pants. A white tyvek is recommended for protection. Use of repellents containing DEET is also effective. It is also important to frequently check for the ticks, which are about the size of a period on this page. Some warning signs include a "bull's-eye" rash that may appear days to weeks after the bite, flu-like symptoms, swelling and pain in joints and, less common, heart arrhythmia, weakness in legs, facial paralysis and numbness. If employees feel they may have contracted the disease, they must notify the SHSC or their respective CHSO.

If an animal bite occurs, the SHSO must be notified. Steps will then be taken to locate the animal and contact the local animal shelter in order to determine if the animal has rabies.

**Contact with Local Flora**

The most dangerous toxic effects from plants are due to ingestion of nuts, fruits, or leaves. Consequently, personnel are prohibited from eating any fruits, nuts, or other plant material which may grow on the site. Of more concern to response personnel are certain plants including poison ivy, poison oak, and poison sumac, which produce adverse effects from direct contact. The usual effect is an allergic dermatitis--inflammation of the skin. The protective clothing and decontamination procedures used for chemicals reduce the exposure risk to the plant toxins. Cleaning the skin thoroughly with soap and warm water immediately after contact will reduce risk as well as the use of pre-exposure creams.

## DECONTAMINATION PROCEDURES

## (CONTINGENCY PLAN IF SITUATIONS WARRANT)

Decontamination of equipment and personnel will be performed to limit the potential migration of contaminants outside the Project Limits (the estimated waste/excavation boundary). All equipment and personnel will be decontaminated before leaving the Property (Trench and Site Grading).

As a general practice, equipment, such as excavators, bulldozers, etc. will remain within the Excavation/Work Zone for the duration of excavation activities, in order to minimize the potential migration of contaminants outside the Project Limits. In addition, the sequence of excavation has been designed to avoid the movement of machinery and personnel over areas within the Work Zone that have been excavated.

Specific procedures will be followed to prevent trackout of soils from the Site Grading and/or Trench Excavation(s) by machinery and personnel. Egress of machinery and personnel that have been working within the Site Grading and Trench areas must pass through a Contaminant Reduction Area (the decontamination pad) at the boundaries of the Site Grading and Trench Excavation.

>Personnel Decontamination

All site personnel will minimize contact with contaminants in order to minimize the need for extensive decontamination. A standard, typical decontamination sequence is presented below. Personnel decontamination will be conducted adjacent to the decontamination pad. Typical gross decontamination will include:

- Remove coverall and dispose
- Outer glove wash/rinse
- Remove outer gloves and dispose of or store on gloverack if reuseable
- Boot wash/rinse
- Remove outer boots and place onto bootrack (or dispose if disposable)
- Rinse hard hat (inside and out) if visibly soiled
- Remove respirator (if worn)
- Wash/rinse respirator (inside and out) and hang for drying (Don't get cartridges wet)
- Remove inner gloves, if worn, and discard

Personal hygiene, hand and face washing, following decontamination will take place in the Support Zone.

Personnel decontamination equipment consists of two wash tubs (boot wash), trash cans with liners (disposable PPE), 5 gallon buckets (glove wash and rinse and respirator wash, sanitize and rinse), brushes, water supply, and detergent. Boot, glove and respirator cleaning and rinsing solutions will be changed at least daily.

>Reusable Sampling Equipment

Reusable equipment should be cleaned in the following manner:

- Detergent in water
- Tap water
- Deionized Water
- Air dry

NOTE: Take particular precautions not to get the "Sensors" wet in "Real Time" or "Instant Readout" units.

Heavy Equipment Decontamination

In order to prevent trackout of soils from the Site Grading and Trench Excavation areas, machinery exiting those areas will travel into the Contaminant Reduction Zone (decontamination pad) and be inspected for the presence of soil or solid contaminants on the tires or other parts of the machinery. Soil or solid contaminants will be mechanically removed from the equipment through brushing or other practicable means before the equipment leaves the decontamination pad. Hand tools will be used for gross removal of solids. A high-pressure water wash may follow. Decontamination will be verified visually. No visible soil will be the benchmark for a decontaminated piece of equipment.

>Disposition of Decontamination Wastes

All equipment and solvents used for decontamination shall be decontaminated or disposed of properly. All disposable PPE will be containerized and properly disposed. All removed material will be managed as hazardous waste, and will be collected, containerized, characterized and appropriately disposed.

>Management of Decontamination Wash Water

Decontamination wash water collected will be pumped on an as-needed basis into a polyethylene tank or drums, located adjacent to the decontamination pad. All aqueous liquids generated in the personnel and equipment decontamination process will be managed as hazardous waste, and will be collected, containerized, characterized and appropriately disposed.

HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36		CDM Constructors Inc.
ROLES AND RESPONSIBILITIES		
<b>Regional Health and Safety Manager (RHSM)</b> <ul style="list-style-type: none"> <li>• Advises and supports management on safety needs and issues.</li> <li>• Prepares and approves HASPs and conducts training, site safety audits, and accident investigations.</li> <li>• Measures safety performance and provides feedback and recommendations to the Chief Operating Officer.</li> <li>• Reviews this Health and Safety Plan periodically and amends it accordingly.</li> <li>• Assists project staff in developing and implementing site safety programs.</li> </ul>		<b>Project Manager</b> <ul style="list-style-type: none"> <li>• Plans at the proposal stage and during project kick-off for compliance with this HASP.</li> <li>• Performs accident investigations (CDM employee injuries only). In cases where second-tier subcontractors are involved, the construction manager notifies the Corporate H&amp;S Director (CHSD) immediately, and the CHSD will collect appropriate injury or accident documentation.</li> <li>• Performs and supports site safety audits and promptly addressing deficiencies.</li> <li>• Conducts initial site orientation meetings.</li> </ul>
<b>Construction Superintendent and Site Health and Safety Officer (SHSO)</b> <ul style="list-style-type: none"> <li>• Overall site emergency coordinator.</li> <li>• Implements the procedures and guidelines outlined in this Health and Safety.</li> <li>• Conducts weekly safety meetings.</li> <li>• Maintains documentation in support of the HASP.</li> <li>• Amends HASP when necessary.</li> <li>• Verifies and documents proper permits and clearances.</li> <li>• Maintains health and safety equipment and supplies, including first aid kit, fire extinguisher, barricade tape, decontamination equipment, materials and fluids, traffic safety equipment, and drum dolly (as needed).</li> <li>• Responsible for equipment calibration (can delegate calibration duties)</li> <li>• Responsible for onsite H&amp;S monitoring (can delegate monitoring duties)</li> <li>• Ensures that a copy of this HASP is on site and available to all employees.</li> </ul> <p>The SHSO has the authority to shut down jobs where safety conditions warrant such action.</p>		<b>Employees and Subcontractors</b> <ul style="list-style-type: none"> <li>• Learn and understand the hazards of the tasks expected</li> <li>• Follow the guidelines presented in this HASP.</li> <li>• Follow procedures outlined at Toolbox Safety Meetings.</li> <li>• Report unsafe conditions or practices to the SHSO immediately.</li> <li>• Report all injuries, illnesses, falls, and near misses to the SHSO immediately.</li> <li>• Offer suggestions to maintain a safe work site.</li> <li>• Inspect equipment, tools, and work areas and maintain safe working conditions by repairing and reporting deficiencies.</li> <li>• Maintain proper and positive health and safety attitudes.</li> <li>• Advise the SHSO of any medication that is required to be taken during the performance of any site activity.</li> </ul>



<p>HEALTH AND SAFETY PLAN Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36</p>		CDM Constructors Inc.
<p><b>SITE-SPECIFIC CONTINGENCY PLAN</b></p>		
<p><u><b>Purpose</b></u> The purpose of this document is to detail the procedures that are to be followed in the event of an emergency. This plan will be distributed to local emergency response agencies as appropriate for their information and use in response to the activities that may take place at the site. Emergency response agencies include the local hospital, fire department, sheriff's department and emergency medical services.</p> <p><u><b>Current Operations</b></u> The <u>Former Building 1/36 area of the Former C-6 Facility</u> is located at <u>1451 Knox Street, Los Angeles, CA 9050</u>. The site consists of new industrial office space, and the surrounding area consists primarily of industrial and commercial properties with some residential developments.</p> <p><u><b>Emergency Coordinator</b></u> If a fire, injury, or any other emergency condition should occur, the appropriate personnel and agencies listed in this document will be immediately notified. The list will be updated whenever changes occur.</p> <p>The Site Health and Safety Officer (SHSO) will be responsible for emergency coordination activities. The <u>CDM Project Manager</u> will be the Primary Emergency Coordinator, and will be contacted by the SHSO during emergency situations. The SHSO will be familiar with all aspects of the site Contingency Plan, all operations and activities at the facility, the location and characteristics of hazardous materials, the location of all records, and the site layout. In addition, the SHSO and designated alternates will be properly trained in Emergency Response procedures.</p> <p>The SHSO and designated alternates have the authority to commit all the resources needed to implement the Contingency Plan. At all times, there is at least one designated Emergency Coordinator, either on the facility premises or on call, who has the responsibility for coordinating all emergency response measures associated with hazardous waste management areas.</p>		<p><u><b>Training</b></u> Personnel training will be conducted by the SHSO or a qualified representative through initial briefings and periodic reviews for all personnel involved in site activities. The SHSO will determine the appropriate training level for site workers Training elements will include an overview of the facility, detailed instructions on site-specific operations, and use of emergency equipment, such as fire extinguisher, and two-way radios if alternate communication is needed.</p> <p>Personnel who may be called upon to use a fire extinguisher will be trained in their use and selection at the beginning of site work. Training will include documentation that informs personnel how to respond effectively to potential emergencies, and familiarizes personnel with emergency procedures.</p> <p>All field team personnel will be required to read and understand the site-specific Health and Safety Plan (HASP), which incorporates this Contingency Plan. Personnel will verify that they have read, understand, and agree to comply with the requirements of the HASP by signing the plan. The HASP, which includes a list of emergency telephone numbers, will be posted at the site.</p> <p><u><b>Under no circumstances will CDM, its employees, or subcontractors allow persons not associated with the project or the client to cross the fence line at any time. This requirement is for the safety and protection of the general public as well all site workers. Anyone violating this policy will be immediately suspended from the site for a duration of time concurrent with Section 16 of the CDM Constructors Health and Safety Manual (Safety Discipline Policy). A complete copy of this manual is located at the site with the CDM superintendent.</b></u></p>

**SITE-SPECIFIC CONTINGENCY PLAN****Medical Emergencies****Preparation**

This HASP identifies a nearby hospital, ambulance, occupational physician, and poison control center. The field team will keep approved first aid kits, in the vehicles used onsite.

**Response**

Emergency first aid treatment may be administered only by trained individuals. The purpose of treatment is to maintain life and/or prevent further injury until professional treatment can be obtained. If an employee is injured or exposed to hazardous substances the field team will take the following actions, as appropriate.

- Evacuate other persons threatened by the condition.
- Move the injured individual to a clean area (on a stretcher, if needed).
- Call the appropriate emergency medical response services (ambulance, fire, hospital, or poison control center) listed in the HASP.
- Remove contaminated clothing (if removal does not endanger the victim).
- Administer appropriate first aid to the injured party if adequate personal safety and blood-borne pathogen controls are available.
- Arrange transportation to local emergency medical facility.

Directions to the hospital are included at the end of this HASP. Emergency telephone numbers are also shown there. (Site Supt. To fill in as needed).

**Communications**

All emergency communications will be conducted by direct vocal communication. If teams work on multiple areas concurrently, communication between the teams will be by means of hand-held radios. Communication between work teams and other organizations will be over the telephone. A list of emergency telephone numbers is provided.

**Evacuation**

When an evacuation is necessary due to an emergency, all field team members will go to the designated assembly point. This area is normally just outside the facility exit gate. The SHSO will designate the assembly area and any other assembly points at the morning toolbox safety meeting, as appropriate. Evacuation routes and assembly points are outlined on page 21 of this plan.

**Fire Emergencies:****Fire Watch**

Every member of the field team will be responsible for observing and reporting any fires, and conditions that could potentially lead to fires.

**Response to Fires**

If a team member observes a fire, he or she may attempt to quench the fire with a fire extinguisher, if one is readily available. If the fire cannot be readily extinguished, the team member will notify all personnel on site to evacuate the area immediately. All onsite personnel shall convene at the reassembly point identified by the SHSO, who in turn will immediately notify the fire department and the Primary Emergency Coordinator.

**Response to Conditions that May Cause Fires**

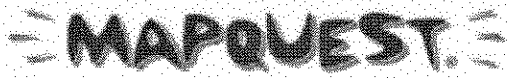
When a team member observes a condition that potentially increases the chance of a fire, he or she will immediately inform the SHSO of the condition. The SHSO will immediately cease any field activity that increases the risk of fire until appropriate controls are in place. The SHSO, with the advice of the Primary Emergency Coordinator, is responsible to take whatever actions are necessary, including withdrawal from the area, to eliminate or reduce the hazardous condition.

# **Site Evacuation Map & Assembly Point (To be completed on site)**

<b>HEALTH AND SAFETY PLAN</b>		<b>CDM Constructors Inc.</b>	
<b>Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36</b>			
<b>EMERGENCY CONTACTS AND PHONE NUMBERS</b>			
<b>(Note: Per Boeing requirements, ALL ONSITE PERSONNEL will have a Dash Card containing safe work practices, emergency and incident reporting procedures with key contact information, and hospital route map).</b>			
<b>CLIENT</b>			
<b>Owner/Operator Primary Emergency Coordinator</b> Dennis Carlson	<b>Cell: (818) 535-7438</b>	<b>Alternate Owner Emergency Coordinator</b> Joe Weidmann, Haley and Aldrich (BRC Oversight Consultant)	<b>Work: (805) 563-2426</b> <b>Cell: (805) 451-2320</b>
<b>CDM</b>			
<b>Regional Health &amp; Safety Manager :</b> Joseph Leslie	<b>Cell: 562-217-7152</b>	<b>Project Manager : Ravi Subramanian</b>	<b>Work: (949)-752-5452</b> <b>Cell: (714) -308-2945</b>
<b>Corporate Health &amp; Safety Manager:</b> Steve Robinson	<b>Cell: 315-529-7050</b>		
<b>CDM Occupational Physician: <u>Dr. Ivan Wolf</u></b> <b>- Industrial Medical Associates</b> <b>961 Canal Street, Syracuse, NY</b>	<b>315-478-1977</b>	<b>Construction Project Mgr./Alternate SHSO:</b> Scott Supernaugh	<b>Work: (949) 752-5452</b> <b>Cell : 562 572-0811</b>
		<b>Construction Oversight/SHSO:</b> Curtis Wilson	<b>Cell: (661) 341-0240</b>
		<b>Secondary SHSO:</b> Sharon Wallin	<b>Work: 949-752-5452</b>
<b>KEY SUBCONTRACTORS – JHA and ICS</b>			
<b>JHA Project Manager</b> Greg Gibbs	<b>Cell: (714)-719-6856</b>	<b>ICS Project Manager</b> John Heiser	<b>Cell: (714) 822-4561</b>
<b>JHA Site Lead</b> Stan Jackson	<b>Cell: (562) -673-1754</b>	<b>ICS Site Lead</b> John Roels	<b>Cell: </b>
<b>Emergency Resources</b>			
<b>Emergency Response Contractors</b>	<b>N/A</b>	<b>Hospital - Harbor UCLA Medical Center</b>	<b>310-222-2101</b>
<b>Fire Rescue</b>	<b>(911)</b>	<b>State Spill Control Number</b>	<b>(800) 852-7550</b>
<b>Police Department</b>	<b>(911)</b>	<b>Emergency Response</b>	
<b>Sheriff's Department</b>	<b>(911)</b>		
<b><u>ATTENTION: 911 CALLS MADE BY CELL PHONES ARE ROUTED TO THE HIGHWAY PATROL WHICH DOES NOT HAVE AUTOMATIC LOCATION AVAILABILITY. CALLERS SHOULD BE PREPARED TO PROVIDE ADDRESS AND/OR LOCATION TO EMERGENCY RESPONSE OPERATORS</u></b>			
<b>United States</b> <b>US EPA Release Report Number</b> <b>US Coast Guard Hazardous Materials Spills</b> <b>Chemical Transportation Emergency Center (CHEMTREC)</b>	<b>(800) 424-8802</b> <b>(800) 424-8802</b> <b>(800) 424-9300</b>	<b>Other</b> <b>Poison Information Center</b>	<b>1-800-452-7165</b>



<b>HEALTH AND SAFETY PLAN</b> <b>Former C-6 Facility – Biorecirculation Pilot Test at Former Bldg 1/36</b>	<b>CDM Constructors Inc.</b>
<b>HOSPITAL LOCATION</b>  <b>Hospital Name: <u>Los Angeles County Harbor-UCLA Medical Center</u></b> <b>Phone: <u>310-222-2101</u></b> <b>Hospital Address: 1000 West Carson Street, Torrance, CA</b> <b>24-Hour Ambulance: 911</b> <b>Distance to Hospital: <u>1.93</u> miles from site (Approximately 4 Minutes)</b>  <b>Route to Hospital:</b>	
<p><b>Route to the hospital depends on current site location, as Knox St does not go through to Normandie Avenue. All site workers shall understand how to drive to Normandie Ave from their current location.</b></p> <p><b>From anywhere along Normandie Ave:</b></p> <ol style="list-style-type: none"> <li><b>1. Start out going SOUTH on NORMANDIE AVE towards 196TH ST</b></li> <li><b>2. After 1.5 miles, turn LEFT onto W CARSON ST</b></li> <li><b>3. After 0.3 miles, stop at 1000 W CARSON ST</b></li> </ol> <p><b>From elsewhere on the project:</b></p> <ol style="list-style-type: none"> <li><b>1. Start out going WEST on KNOX ST towards HARBORGATE WAY</b></li> <li><b>2. After 1 block, turn LEFT onto HARBORGATE WAY</b></li> <li><b>3. After 1 block, turn LEFT onto FRANCISCO ST</b></li> <li><b>4. After 1 block, turn RIGHT onto NORMANDIE AVE towards 196TH ST</b></li> <li><b>5. After approximately 1 mile, turn LEFT onto W CARSON ST</b></li> <li><b>6. After 0.3 miles, stop at 1000 W CARSON ST</b></li> </ol> <p><b>(See attached hospital directions and site maps for more information)</b></p>	

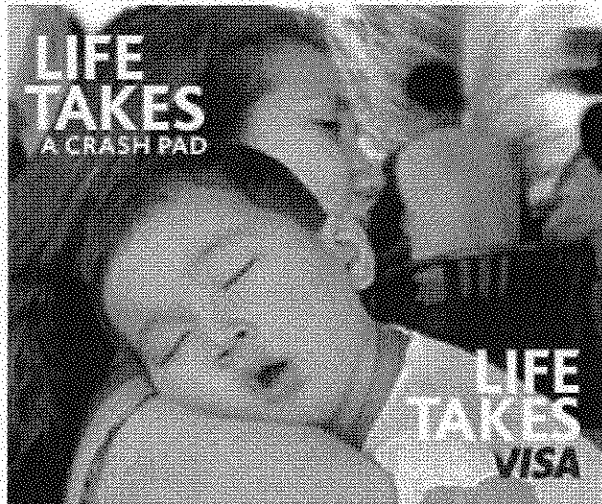


**Start:** 19503 Normandie Ave  
Torrance, CA 90502-1109, US

**End:** Los Angeles County Hospitals:  
310-222-2345  
1000 W Carson St, Torrance, CA  
90502, US

**Notes:**

DIRECTIONS TO HOSPITAL  
FROM ALONG NORMANDIE  
AVE ONLY!



**Directions**

**Distance**

**Total Est. Time:** 4 minutes      **Total Est. Distance:** 1.93 miles

**START** 1: Start out going SOUTH on NORMANDIE AVE toward W 196TH ST. 1.5 miles

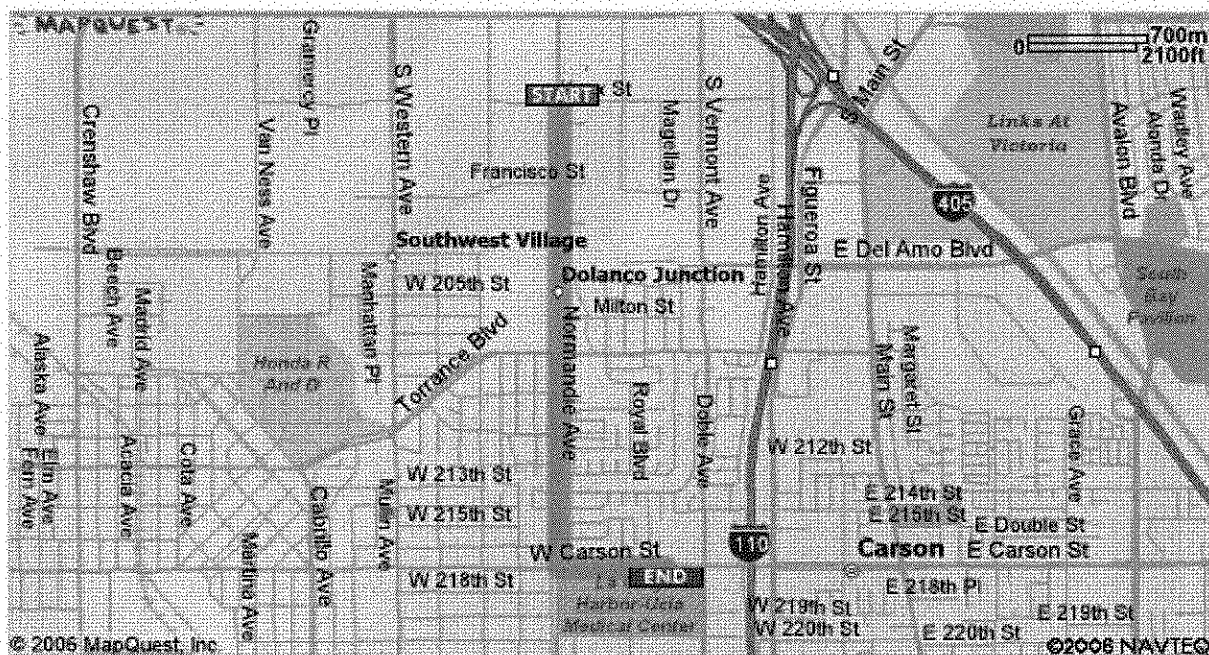
 2: Turn LEFT onto W CARSON ST. 0.3 miles

**END** 3: End at Los Angeles County Hospitals  
1000 W Carson St, Torrance, CA 90502, US

**Total Est. Time:** 4 minutes      **Total Est. Distance:** 1.93 miles

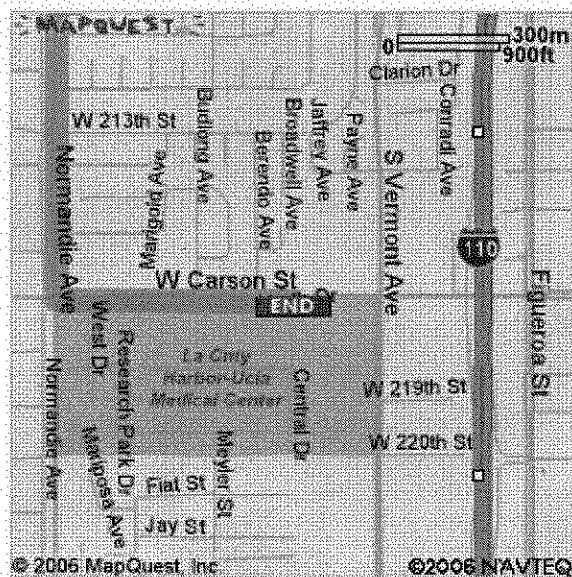
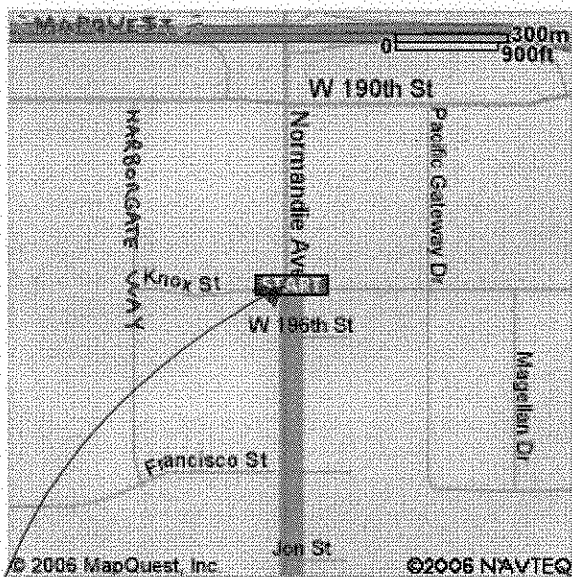
NOTE:

KNOX STREET DOES NOT GO THROUGH TO NORMANDIE AVE!  
FOR DIRECTIONS FROM ON SITE, SEE WASP.  
USE ~~MAP~~ ATTACHED MAP AND SITE PLAN IF NEEDED.



**Start:**  
**19503 Normandie Ave**  
 Torrance, CA 90502-1109, US

**End:**  
**Los Angeles County Hospitals:**  
 310-222-2345  
 1000 W Carson St, Torrance, CA 90502,  
 US



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These directions are informational only. No representation is made or warranty given as to their content, road conditions or route usability or expeditiousness. User assumes all risk of use. MapQuest and its suppliers assume no responsibility for any loss or delay resulting from such use.

★ KNOX STREET DOES NOT GO THROUGH TO NORMANDIE. ★  
 USE HARBOR GATE WAY → FRANCISCO STREET IF NEEDED.

# **Attachment A**

## **Hazard Analysis**

# Preliminary Hazard Analysis

Location: BRC Former C-6 Facility Date(s) job will be conducted: 2007-2008

Job Location: 1451 W. Knox Street, Los Angeles, CA 90501

Employee(s) or Contractor Performing Work: CDM, ICS, JHA, Driller (TBD)

Supervisor Responsible for Safety: Scott Supernaugh, Curtis Wilson, Joe Leslie

Required PPE: ☒ Hard Hat: ☒ Safety Shoes: ☒ Safety Glasses: ☐ Goggles:  
☒ Ear Plugs: ☒ Respirator: ☐ High Voltage: ☐ Fall Protection:  
☐ Level A: ☐ Level B: ☒ Level C: ☒ Level D  
☒ Other: Tyvek Coveralls as needed

General Housekeeping required?	<input checked="" type="checkbox"/> Yes	No	N/A
Are Emergency procedures established?	<input checked="" type="checkbox"/> Yes	No	N/A
<b>Will spark/flame producing devices be used?</b>	Yes	<input checked="" type="checkbox"/> No	N/A
<b>Will confined space entry be required?</b>	Yes	<input checked="" type="checkbox"/> No	N/A
Is a hazardous atmosphere possible?	<input checked="" type="checkbox"/> Yes	No	N/A
Is an oxygen deficient atmosphere possible?	Yes	<input checked="" type="checkbox"/> No	N/A
Will chemicals be used? (List)	<input checked="" type="checkbox"/> Yes	No	N/A
Is asbestos present?	Yes	<input checked="" type="checkbox"/> No	N/A
Will excavation be more than 5 feet in depth?	Yes	<input checked="" type="checkbox"/> No	N/A
Will walls, ceiling, or floor be penetrated?	Yes	<input checked="" type="checkbox"/> No	N/A
Will work above 6 feet be required?	Yes	<input checked="" type="checkbox"/> No	N/A
Will ladders be used?	<input checked="" type="checkbox"/> Yes	No	N/A
Will scaffolds be used?	Yes	<input checked="" type="checkbox"/> No	N/A
Will work platforms or man lifts be used?	Yes	<input checked="" type="checkbox"/> No	N/A
Will roof work be required?	Yes	<input checked="" type="checkbox"/> No	N/A
Will a crane be required?	Yes	<input checked="" type="checkbox"/> No	N/A
Will a forklift be required?	Yes	<input checked="" type="checkbox"/> No	N/A
Will lockout/tagout be required?	Yes	<input checked="" type="checkbox"/> No	N/A
<b>Will energized electrical work be required?</b>	<input checked="" type="checkbox"/> Yes	No	N/A
Will pneumatic power tools be used?	Yes	<input checked="" type="checkbox"/> No	N/A
Is work on natural gas systems required?	Yes	<input checked="" type="checkbox"/> No	N/A
Work on high pressure systems required?	Yes	<input checked="" type="checkbox"/> No	N/A
Will explosives be used or present?	Yes	<input checked="" type="checkbox"/> No	N/A
Will biohazards be present?	Yes	<input checked="" type="checkbox"/> No	N/A
Will machine tools be used?	<input checked="" type="checkbox"/> Yes	No	N/A
Will vehicle/pedestrian traffic be disrupted?	<input checked="" type="checkbox"/> Yes	No	N/A
Will barricades/access control required?	<input checked="" type="checkbox"/> Yes	No	N/A
Will lasers be used?	<input checked="" type="checkbox"/> Yes	No	N/A
Is the project located on a hazardous waste site?	<input checked="" type="checkbox"/> Yes	No	N/A
<b>Will work be in a radiological area?</b>	Yes	<input checked="" type="checkbox"/> No	N/A
Have workers received RAD worker training?	Yes	<input checked="" type="checkbox"/> No	N/A
Will the contractor be on site more than 30 days?	<input checked="" type="checkbox"/> Yes	No	N/A
OTHER HAZARDS?	Yes	No	N/A Please List: _____

If yes, attach an activity hazard analysis.

Completed By: Jeff Bamer Title: Environmental Engineer Date: 4/5/2007

Approved By: Joe Leslie Title: Health and Safety Manager Date: \_\_\_\_\_

Is a HASP Required? ☒ Yes ☐ No ☐ N/A Is a Safe Work Plan required? ☐ Yes ☒ No ☐ N/A

Additional Comments: This PHA addresses Biorecirculation Pilot Test System Installation and O&M tasks

Note: Items in Bold Need a Permit

CDM

# **Attachment B**

## **CDM Standard Work Practices and Guidelines for Health and Safety**

- 1. Noise/Hearing Conservation**
- 2. Housekeeping**
- 3. Manual Materials Handling**
- 4. Electrical Safety**
- 5. Lockout/Tagout Procedures**
- 6. Fall Protection**
- 7. Excavations**
- 8. Ladders**
- 9. Tools and Power Equipment**
- 10. Heat Stress**
- 11. Working Around Heavy Equipment**
- 12. Working Safely Around Drill Rigs**
- 13. Hazardous Waste Site Controls**
- 14. Hazardous Waste Site Decontamination**
- 15. Traffic and Work Zone Safety**
- 16. Cell Phone Safety**

# Section 15

## Hearing Conservation

### 15.1 Purpose and Scope

The purpose of this section is to prevent permanent and temporary occupational hearing loss that results from overexposure to noise. This section is applicable to all Camp Dresser & McKee Inc. (CDM) employees and to all equipment and property used by CDM.

### 15.2 Definitions

**Action Level** - An exposure to an 8-hour time-weighted average of 85 decibels measured with a dosimeter or sound-level meter on the A-scale at slow response; or equivalently, a dose of 50 percent measured as per paragraph 15.5.5 of this section. The action level is the criterion for instituting noise surveys and employee participation in the audio metric testing program.

**Administrative Control** - Any procedure that limits noise exposure by control of work schedules.

**Audiogram** - A chart, graphs, or tables that result from an audiometric test. An audiogram shows an individual's hearing threshold level as a function of frequency (Hz).

**Audiologist** - A professional who specializes in the study and rehabilitation of hearing and who is certified by the American Speech, Hearing and Language Association, or licensed by a state board of examiners.

**Audiometer** - An electronic instrument that measures hearing threshold levels and conforms to the requirements and specifications of the current ANSI Standard S3.6.

**Baseline Audiogram** - An audiogram against which future audiograms are compared. It may also be described as a reference, pre-placement, pre-assignment, or entrance audiogram.

**Biological "Functional" Calibration Check** - An audiometric test that uses one or more individuals with known, stable hearing levels to check proper functioning and stability of an audiometer and to identify any unwanted or distracting sounds.

**Cut-off Level** - All sound levels at or above the cut-off level are averaged into the calculations that relate to noise exposure. All sound levels below the cut-off level are not included.

**Deafness**: The condition in which the average hearing threshold level for pure tones at 500, 1000, 2000, and 3000 Hz (frequencies used for speech), is at least 93 decibels (reference ANSI S3.6-1969). This is generally accepted as representing a 100 percent hearing handicap for normal speech.

**Decibel (dB)** - A unit of measurement of sound-pressure level. The decibel level of a sound is related to the logarithm of the ratio of sound pressure to a reference pressure. The dB has meaning only when the reference is known. The internationally accepted reference pressure used in acoustics is 20 micropascals.

**Decibels, A-Weighted (dBA)** - A sound level reading in decibels made on the A-weighting network of a sound-level meter at slow response.

**Decibels, Peak (dBp)** - A unit used to express peak sound-pressure level of impulse noise.

**Dose Criterion Sound Level** - The average sound level at a given dose criterion length for which the dose represents 100 percent of the allowable exposure. The Federal Occupational Safety and Health Administration (Fed-OSHA) requires a dose criterion sound level of 90 dBA for an exposure duration of eight hours. ARC has a dose criterion level of 85 dBA for an 8-hour exposure, per section 29.6.

**Dose Criterion Length** - The permissible exposure duration (in hours) for a given dose criterion sound level for which the dose represents 100 percent of the allowable exposure.

**Eight-Hour Dose** - The actual dose (as a percentage) accumulated over the duration of the work shift and based on a regulations defined criterion level and criterion length.

**Engineering Control** - Any mechanical device, physical barrier, enclosure, or other design procedure that reduces the sound level at the source of noise generation or along the path of propagation of the noise to the individual. This does not include protection equipment such as earmuffs, plugs, or administrative controls.

**Hazardous Noise** - Noise generated by an operation, process, or procedure that is of sufficient duration and intensity to be capable of producing a permanent loss of hearing in an unprotected person. Generally, this is interpreted as persistent noise levels equal to or greater than 85 dBA or combinations of higher intensities for durations shorter than 8 hours.

**Hertz (Hz)** - A unit of measurement of frequency that is numerically equal to cycles per second.

**Impulsive or Impact Noise** - Variations in noise levels that involve peaks of intensity that occur at intervals of greater than one second. If the noise peaks occur at intervals of one second or less, the noise is considered continuous.

**L<sub>av</sub>** - The average sound level (in dBA) computed for a chosen averaging time duration.



**Lav (80)** - The average sound level (in dBA) computed for a chosen averaging time duration, using an 80-dBA cut-off level. The 80-dBA cut-off level is used by Fed-OSHA for hearing conservation compliance requirements.

**Manager** - A broad term that can refer to managers, program and project managers, direct managers, site managers, supervisors, department heads, group heads, branch chiefs, owners, and/or persons that operate in a management capacity or supervisory roll with respect to affected employees.

**Medical Pathology** - A disorder or disease. For the purposes of this chapter, a condition or disease that affects the ear and should be treated by a physician specialist.

**Monitoring Audiogram** - An audiometric test obtained at least annually to detect shifts in an individual's threshold of hearing by comparison to the baseline audiogram.

**Noise** - Unwanted sound.

**Noise Dose** - A measure of cumulative noise exposure over a stated period, which takes into account both the intensity of the sound and the duration of the exposure.

**Noise Dosimeter** - An electronic instrument that integrates cumulative noise exposure over time and directly indicates a noise dose.

**Noise Hazard Area** - Any work area with a noise level of 85 dBA or greater.

**Otolaryngologist** - A physician who specializes in the diagnosis and treatment of disorders of the ear, nose, and throat.

**Representative Exposure** - The measurements of an employee's noise dose, or an 8-hour time-weighted average sound level that a qualified person deems representative of the exposure of other employees in that work area or job classification.

**Standard Threshold Shift (STS)** - An average hearing threshold shift of 10 dB or more at 2000, 3000, and 4000 Hz in either ear. A threshold shift can be temporary or permanent. Temporary threshold shift is a change in hearing threshold, primarily due to exposure to high-intensity noise, that is usually recovered in 14 to 72 hours. Any loss that remains after an adequate recovery period is termed permanent threshold shift.

**Sound-pressure level** - The term used to identify a sound measurement (expressed in decibels) obtained with a sound-level meter that has a flat frequency response. This is mathematically equivalent to 20 times the common logarithm of the ratio of the measured A-weighted sound pressure to the standard reference pressure of 20 micropascals (measured in decibels). For use with this standard, slow time response is required in accordance with the current ANSI.S1.4.

**Sound-level meter (SLM)** - An electronic instrument for the measurement of sound levels that conforms to the requirements for a Type II sound-level meter as specified in ANSI S1.4-1971.

**Time-Weighted Average (TWA) Sound Level** - the sound level that, if constant over an 8-hour workday exposure, would result in the same noise dose as is measured.

**TWA (80)** - The time-weighted average level that corresponds to a noise dose computed with an 80-dBA cut-off level.

## 15.3 Responsibilities

### Health and Safety Manager (HSM)

- Develops and implements a hearing conservation program.
- Provides guidance to employees whose jobs expose them to hazardous noise levels and their managers.
- Provides periodic noise monitoring when necessary.
- Periodically reviews the hearing conservation program for compliance standards.
- Provides employees access to noise survey/dosimetry records.
- Coordinates the medical surveillance program that includes baseline and annual audiograms.
- Recommends the selection of hearing protection and specify performance (attenuation) requirements.
- Notifies management of all areas that have been designated as noise hazard areas.

### Health and Safety Coordinators (HSC)

- Reports suspected hazardous noise areas to the HSM so that noise monitoring can be conducted.
- Ensures that employees who work in designated noise hazard areas (or are otherwise exposed to hazardous noise) receive pre-placement, annual, and termination audiograms.
- Ensures that employees in high-noise areas use hearing protection devices.
- Notifies the HSM of any changes in operations that require noise determinations or evaluations.
- Ensures that hearing protection devices that have been approved by the HSM are available for use by employees.

- Ensures that employees who participate in the Hearing Conservation Program attend required training and provides documentation of such training to the HSM.
- Ensures that caution signs are posted in designated noise hazard areas.
- Ensures the design and application of engineering controls recommended by the HSM that are needed to reduce noise exposures to acceptable limits or to the maximum extent feasible.

### **Employees**

Employees who work in high noise areas are responsible to:

- Wear and maintain hearing protection as required by the HSC.
- Cooperate with H&S personnel in activities undertaken to evaluate hazardous noise.
- Notify direct or project manager or HSC of areas, operations, or equipment that may produce hazardous noise.
- Attend hearing conservation training when necessary.
- Participate in the medical surveillance program.

## **15.4 Noise Exposure Limits**

Protection against the effects of noise exposure shall be provided when sound levels exceed those in the Tables 15-1 and 15-2 below. Noise exposure limits are generally applied as an 8-hour exposure limit of 85 dBA. For exposures of shorter or longer durations, the exposure limit may be adjusted as indicated in the table. Hearing conservation program elements are expected to be implemented whenever employee noise exposures equal or exceed an 8-hour time-weighted average of 80 dBA measured as per paragraph 15.5.5 of this Section. Hearing conservation program elements include exposure monitoring, audiometric testing, medical monitoring, and training. The dose criterion of 80 dBA for an 8-hour exposure is referred to as the action level.

**Table 15-1 Continuous Noise Permissible Exposure Limits**

Duration (Hours)	Sound Level (dBA)*
16	80
8	85
4	90
2	95
1	100
0.5	105
0.25	110
0.125 or less	115

\*Measured on the A-scale of a standard sound-level meter set at slow response.

**Table 15-2 Impulse Noise Permissible Exposure Limits**

Sound Level (dBP)*	Permitted Impulses/Day
140	100
130	1,000
120	10,000

\*Peak sound-pressure level.

## 15.5 Hearing Protection Methods

### 15.5.1 Engineering Controls

Where feasible, facilities and equipment will be procured, designed, operated, and/or modified in such a manner as to prevent employee exposure to continuous noise levels above 85 dBA over an 8-hour TWA or impulsive noise above 125 dBP. Any reduction in employee noise exposure, even if not reduced below 85 dBA, is beneficial. If engineering controls fail to reduce sound levels to within the limits of section 4.0 hearing-protective equipment and/or administrative methods of noise-exposure protection must be used.

### 15.5.2 Personal Hearing Protection

- Personal protective equipment is to be used only temporarily or if engineering controls are not feasible or practical.
- The HSCs shall enforce the use of earmuffs and/or plugs by employees assigned to work in areas where they will be exposed to continuous noise (without regard to duration of exposure) in excess of 85 dBA or to impulse noise in excess of 140 dB. Disposable earplugs and/or earmuffs will be made available for employee use (if desired) if noise exposures under 85 dBA create a nuisance. Earplugs will be provided for the exclusive use of each employee and will not be traded or shared.
- Hearing protectors must attenuate employee noise exposure to a level of 85 dBA or below. Both earmuffs and plugs are required where noise levels equal or exceed 110dBA. For employees with STS, protectors must attenuate exposure to an 8-hour TWA of 80 dBA. Estimation of the adequacy of hearing-protector attenuation should be performed according to the methods OSHA specifies in 29 CFR 1910.95 App B, Methods for estimating the adequacy of hearing protector attenuation.
- If reusable pre-formed earplugs are used, they will be permanently issued to the employee and fitted to the employee under medical supervision. During fitting, the employee will be instructed in the proper method of insertion, storage, and cleaning of the earplugs. Earplugs will be checked during annual medical examinations.
- Earmuffs will be provided for employees when analysis of noise environments shows that the attenuation provided by earplugs is not sufficient to reduce noise exposures below 85dBA. The user shall inspect earmuffs on a regular basis.
- Special hearing-protective equipment, such as sound-suppression communication headsets, may be used in noise hazard areas. These devices should be inspected regularly. Sound-suppression headsets may not be used if they have been damaged, altered, or modified in any way that affects the attenuation characteristics. If replacement parts (such as ear cup seals) are available, the headsets may be repaired and reused. If sound-suppression headsets are not permanently issued to employees, such equipment must be cleaned and sanitized before re-issuance.

### 15.5.3 Administrative Controls

If hearing-protective equipment or engineering controls are not sufficient to attenuate noise to less than 85 dBA, the duration of time spent in the noise hazard area shall be limited, so as not to exceed the exposure limits specified in this section 4.0.

### 15.5.4 Noise Monitoring

- Measurement of potentially hazardous sound levels shall be conducted when any information, observation, or calculation suggests that an employee could be exposed to a noise level in excess of an 8-hour TWA. This includes, but is not

limited to, times when representative exposures need to be documented, when employees complain of excessive noise, or when it is difficult to understand a normal conversation if the speaker and the listener face each other at a distance of two feet. Any new equipment, operation, job, or procedure with the potential for creating hazardous noise should be evaluated with regard to noise emissions before startup. All continuous, intermittent, and impulsive sound levels from 80 to 130 dBA will be integrated into the noise measurements.

- Both noise dosimetry and area monitoring will be repeated periodically, or whenever any changes to facilities, equipment, work practices, procedures, or noise-control measures alter potential noise exposures.
- Employees and/or their representatives will be provided an opportunity to observe noise dosimetry and area monitoring activities.
- Areas determined to have noise levels at or above 85dBA must be posted as noise hazard areas.
- Affected employees (employees whose exposures have been determined to exceed the Action Level) shall be notified of the results of noise monitoring.

### **15.5.5 Noise-Measurement Methods**

- Sound-level meters must meet Type II requirements of ANSI S1.4 and must be capable of measuring sound in the range of 80 to 130 dBA.
- Noise dosimeters must meet Class 2A-90/80-5 requirements of ANSI S1.25 and be capable of integrating sound levels of 80 dB and above.
- Employee noise doses may be ascertained by using either a noise dosimeter or sound-level meter. If a sound-level meter is used to estimate an employee's dose, the noise survey will include a time and motion study to document the variations in the employee's noise exposure during the working shift. If an employee moves about or noise intensity fluctuates over time, noise exposure is more accurately estimated by personal dosimetry. Regardless of the method chosen, a sufficient number of readings/measurements will be made to accurately reflect noise exposure.
- Employee exposure measurements will be made in such a manner as to accurately represent the actual exposure to noise.
  - When using a noise dosimeter to determine an employee's noise exposure, the microphone will be attached to the employee in the area of the employee's shoulder.
  - When using a sound-level meter, the microphone should be positioned not less than two inches, nor more than two feet, from the employee's ear.

- Measurements will be made with the employee at his/her regular work stations(s).
- Before and after each use, dosimeters and sound-level meters will be calibrated using acoustical calibrators to verify the accuracy of the measuring equipment.
- If any sound-level meter or noise dosimeter is dropped, or if the microphone receives a sharp impact, a calibration check shall be performed to ensure that it is still working properly, before taking additional measurements.
- Sound-level meters and noise dosimeters that are not working properly, or are out of calibration, shall not be used to determine an employee's noise exposure.

## 15.6 Medical Surveillance Program

### Program Participation

- Whenever an employee is routinely occupationally exposed to continuous noise at or above the Action Level or to impact or impulsive noise in excess of the limits specified in Section 4.0, the employee shall be enrolled in a medical surveillance program. Employee noise exposure shall be determined without regard to any sound attenuation provided by the use of hearing protectors.
- Each employee placed in a job that required participation in a medical surveillance program shall undergo a physical examination before being assigned to duties that involve exposure to high-intensity noise. The examination shall include a baseline audiogram, a medical examination to determine any pre-existing medical pathology of the ear, and a work history to document past noise exposures. The history shall include a detailed review of past work histories and possible occupational and non-occupational noise exposures.
- When it is discovered that employees have been working where they encounter hazardous noise or incur exposures that exceed the action level and have not had a physical examination, one shall be conducted within 30 days. The audiogram must follow at least 14 hours of no known exposure to sound levels in excess of 80 dBA. This interval should be sufficient to allow recovery from noise-induced temporary threshold shift.
- Personnel who suffer from acute diseases of the ear shall not be placed in hazardous noise areas until the condition has abated, particularly if such diseases preclude the wearing of hearing protectors, cause hearing impairment, or produce tinnitus.
- All employees who are participants in the medical surveillance program must receive an annual audiogram.

- All CDM employees who have participated in the medical surveillance program shall receive a final audiometric examination before termination of employment with CDM, job changes within the installation that would alter noise exposure, transfer to another installation, or retirement.

## **15.7 Audiometric Testing**

### **15.7.1 Medical Personnel**

Medical personnel who perform audiometric tests must be qualified, trained, and knowledgeable in operating equipment used and be under the supervision of an audiologist or physician. If manual audiometers are used, the Council for Accreditation in Occupational Hearing Conservation must certify qualifications of personnel who operate the audiometer. Hearing threshold levels will be determined by audiometers calibrated to zero reference levels of the ANSI S3.6 standard for audiometers.

### **15.7.2 Pure Tone, Air Conduction Testing**

Pure tone, air conduction testing shall be conducted at test frequencies of 500, 1000, 2000, 3000, 4000, and 6000 Hz for each ear. Audiometric test equipment shall meet the specification, maintenance, and use requirements of ANSI S3.6. Where a pulsed-tone, self-recording audiometer is used, it will also meet the requirements of 29 CFR 1910.95, Table 3.

- A listening check shall be performed daily before use to ensure that the audiometer is free from distorted or unwanted sounds.
- A functional check shall be performed each day either by using an “acoustical ear” calibrator (dBA sound-level meter with 9A Type Earphone Coupler) or by testing an individual with a known and stable hearing baseline (a “biological check”). A record will be kept of the daily checks. Deviations of 5 dB or more require an acoustical calibration test.
- An acoustical calibration test (using a sound-level meter, octave-band filter set, and a National Bureau of Standards 9A Coupler) shall be performed at least annually (semi-annually for self-recording audiometers), or when a functional check indicates a deviation of 5 dB or more. The acoustical calibration tests shall conform to the requirements of 29 CFR 1910.95, Appendix E. Deviations of 10 dB or more will require an exhaustive calibration.
- An exhaustive calibration shall be performed at least every two years, or whenever an acoustical calibration test indicates an error of 10 dB or more. The test will meet the criteria of the current ANSI S3.6 guidelines appropriate for the instrument. Following calibration, the front panel of the audiometer shall be labeled with a tag indicating that it has been calibrated to ANSI S3.6 guidelines and the date of the calibration.



- Rooms used for audiometric testing shall not have background sound-pressure levels that exceed those in the table below. Sound-pressure levels for rooms used for audiometric testing must be checked at least every two years.

**Table 15-3 Maximum Background Sound-Pressure Levels  
for Audiometric Test Booths**

Frequency (Hz)	Sound-Pressure Level (dBA)
500	27
1,000	30
2,000	35
4,000	42
8,000	45

- Employees must receive advance written notification of the need to avoid high levels of occupational and nonoccupational noise during the 14 hours immediately preceding an audiometric test. Properly fitted hearing protectors and/or other hearing-protective devices may be used to prevent excessive noise exposures during this period.
- A physician or other qualified person shall compare annual audiograms with the employee's baseline audiogram, to determine if it is valid and if a standard threshold shift has occurred. It is desirable to review the employee's audiogram record for patterns of change over time. When determining if a standard threshold shift has occurred, allowances for the effects of aging to the hearing threshold level may be made using the procedure described in 29 CFR 1910.95, Appendix F. Audiograms referenced to ASA-1951 must be converted to ANSI S3.6-1969 before hearing threshold levels can be properly determined (see the table below for conversion).

**Table 15-4 Threshold Audiogram Conversion ASA-1951 to ANSI-1969**

Frequency	dB Difference
250	15
500	15
1000	10
2000	10
3000	10
4000	5
6000	10
8000	10

- To convert an ASA-1951 reference threshold audiogram to ANSI-1969, add the difference in values.
- To convert ANSI-1969 to ASA-1951, subtract the values.
- When evaluation of an audiogram indicates that a standard threshold shift has occurred, a retest shall be scheduled within 30 days to determine if the shift is temporary or permanent. A medical evaluation may be warranted at this time to determine if an acute medical condition is a contributing factor.
- An annual audiogram may be substituted for the baseline when, in the judgment of the audiologist, otolaryngologist, or physician who is evaluating the audiogram, the hearing threshold shown on the annual audiogram indicates significant improvement over the baseline audiogram.
- The employee will be notified of audiometric testing results in writing within 21 days of determination of a permanent threshold shift. The subcontract health care provider retained by CDM shall notify the employer and employee in writing of determinations of permanent threshold shifts.

### 15.7.3 Criteria for Referral to an Audiologist

- The following are criteria for referral to an audiologist for more comprehensive testing.
- Average hearing threshold level greater than 25 dB at 500, 1000, and 2000 Hz.

- Single frequency loss greater than 55 dB at 3000 Hz, or greater than 30 dB at 500, 1000, or 2000 Hz.
- Difference in average hearing threshold level between the better and poorer ear of more than 15 dB at 500, 1000, and 2000 Hz; or more than 30 dB at 3000, 4000, and 6000 Hz.
- Reduction in hearing threshold level in either ear from the baseline or previous monitoring audiogram of more than 15 dB at 500, 1000, or 2000 Hz; or more than 30 dB at 3000, 4000, or 6000 Hz.
- Variable or inconsistent responses or unusual hearing-loss curves.

#### **15.7.4 Conditions that Require Follow-Up Review of Employees with Hearing Illness and Responses**

- When a permanent threshold shift is detected, a follow-up review must be conducted.
- An employee who is not currently using hearing protection shall be provided (and fitted as necessary) with hearing protectors and shall be trained in their use.
- The employee shall be provided/refitted with hearing protectors that offer greater sound attenuation, as warranted, if hearing protectors are already in use.
- The employee shall be trained/retrained on the hazardous effects of noise and the need to use hearing protection.
- The employee's work area shall be investigated to determine if work practices or changes in equipment or procedures can be made that will decrease noise hazards or if changes have resulted in an increase in noise hazards.
- The employee shall be reassigned to work in a low-noise area, as necessary, to prevent further hearing impairment. The employee will continue to participate in the Hearing conservation program.

### **15.8 Noise Hazard Warning Signs**

Caution signs that clearly indicate a hazard of high noise levels and the requirements to wear hearing protection shall be posted at the entrance(s) to, and the periphery of, noise hazard areas. Decals or placards with similar statements shall be affixed to power tools and machines that produce hazardous noise levels. Signs and decals shall have wording in black letters on a yellow background (Refer to section 15.11 for noise hazard warning sign specifications.)

### **15.9 Employee Training**

- Each employee who participates in the Hearing conservation program shall receive annual training. The training must include, but not be limited to:

- An overview of the CDM Hearing conservation program
  - A review of the effects of noise on hearing (including permanent hearing loss)
  - Noise control principles
  - The purpose, advantages, disadvantages, and attenuation characteristics of various types of ear protectors
  - Instruction on selection, fitting, use, and care of hearing protectors
  - An explanation of the audiometric testing and its purposes
- Personnel will be encouraged to use hearing protectors when exposed to hazardous noise in non-occupational settings (e.g., from lawn mowers, firearms, etc.).

## 15.10 Records Maintenance

- Audiogram and noise-exposure records shall be maintained as a permanent part of employee medical records. If noise-exposure measurement records are representative of the exposures of other employees participating in the hearing conservation program, the range of noise levels, and the average noise dose will be made a permanent part of the medical records of the other employee as well.
- In addition to audiometric test data, each medical record will, as a minimum, identify:
  - The audiometric reference level to which the audiometer was calibrated at the time of testing
  - The date of the last calibration of the audiometer
  - The name, the social security number, and job classification of the employee tested
  - The employee's most recent noise exposure assessment
  - The date(s) hearing conservation training was received.
- Records of the background sound-pressure levels in the audiometric test rooms, and data and information concerning calibration and repair of sound-measuring equipment and audiometers (as well as all audiometric test data) will be maintained by CDM's medical consultant in accordance to OSHA and other applicable regulations.
- Accurate records of noise surveys/monitoring, results of the special noise studies, and records of special actions or engineering controls installed to control noise

exposures will be maintained for the duration of the affected employee's employment, plus 30 years.

## **15.11 Signs and Decals**

### **15.11.1 Noise Hazard Warning Sign Specifications**

Warning signs must read:

**CAUTION**  
**NOISE AREA**  
**MAY CAUSE HEARING LOSS**  
**USE PROPER**  
**HEARING PROTECTION**  
**IN THIS AREA**

The lettering is almost always all caps, black, and on a yellow background.

### **15.11.2 Noise Hazard Warning Sign Specifications**

Decals must have a yellow background and black lettering (all caps). The decal must be self-adhesive on the side opposite the written warning. The written warning must read:

**CAUTION**  
**NOISY EQUIPMENT MAY CAUSE HEARING LOSS**  
**USE PROPER**  
**HEARING PROTECTION**

The word caution is in yellow lettering with a black background superimposed on the yellow background of the label. As shown, the word caution is two point sizes larger than the lettering in the rest of the warning.

## 16.2 Housekeeping

These guidelines are for the establishment and administration of a clean and orderly work environment at field project sites. A continuous housekeeping program strongly tends to prevent accidents. A clean and orderly work environment can be achieved and maintained through ongoing housekeeping efforts undertaken by personnel at all levels. Project managers shall initiate participation in housekeeping activities and good work habits, not only at the end of a work assignment, but throughout the evolution of the project.

- To achieve these benefits, the team shall plan the location of equipment and storage facilities to allow the easy flow of personnel, equipment, materials, fire hazards, and to prevent the obstruction of evacuation, fire fighting, or rescue activities.
- Store materials in a manner that facilitates access of material handling equipment and personnel handling limitations. Lack of sufficient workspace and storage capacity leads to the potential for accidents and decreases efficiency.
- Avoid storage of flammable liquids, such as paints and thinners unless they are required for specific project needs. If needed, such storage shall be within a metal storage cabinet that has been labeled and approved for the storage of flammable liquids.
- Continuously maintain work areas in a neat and orderly manner.
- Containers should be provided for the collection of waste, trash, and other non-hazardous refuse. Investigation-derived waste and other waste materials that are potentially hazardous should be stored and labeled in accordance with project specific procedures that meet regulatory and client requirements.
- Deploy leads, hoses, and extension cords so they do not present tripping hazards, and are not subject to contact with moisture or physical stress. Where possible they should be hung overhead with non-conductive material and kept away from walkways, doors, stairs, and ladders.
- Protect protruding rebar and anchor bolts and conspicuously mark them.
- Clean small spills that create slip hazards and or flammability hazards immediately and not leave them unattended.
- Keep walkways, aisles, stairways, and passageways in a clear and unobstructed condition.
- Prohibit eating and drinking in work areas where there is potential exposure to toxic or hazardous materials. Smoking is limited to designated smoking areas where there is no such exposure.

## 16.3 Manual Material Handling

Camp Dresser & McKee Inc. (CDM) employees should follow the work practices outlined below when lifting and carrying heavy objects.

- Test any load they are required to lift, and compare its weight, volume, and shape to their lifting abilities. Employees shall not attempt to lift beyond their capacity.
- Obtain assistance in lifting heavy objects. Back belts or back braces may be used if desired, however many ergonomists do not believe that these devices create a benefit or provide protection.
- When two or more persons are involved in a manual lift, one person should provide direction of the lift.
- When two or more persons are carrying an object, each employee, if possible, should face the direction in which the object is being carried.
- When two or more persons carry a heavy object that is to be lowered or dropped, there shall be a prearranged signal for releasing the load.
- The right way to lift is easiest and safest. Crouch or squat with the feet close to the object to be lifted, secure good footing, take a firm grip, bend the knees, keep the back vertical, and lift by bending at the knees and using the leg and thigh muscles. Exercise caution when lifting or pulling in an awkward position.
- Employees should avoid twisting or excessive bending when lifting or setting down loads.
- When moving a load horizontally, employees should push the load rather than pull.
- For tasks that require repetitive lifting, the load should be positioned to limit bending and twisting. The use of lift tables, pallets, and mechanical devices should be considered.
- When gripping, grasping, or lifting an object such as a pipe or board, the whole hand and all the fingers should be used. Gripping, grasping, and lifting with just the thumb and index finger should be avoided.

## 16.4 Electrical Safety

The following work practices can eliminate or minimize the potential for electrical shock, fires, and burns when working on or around electrical equipment.

- Treat all electrical circuits as live until their condition has been verified. Treat even low voltages as dangerous.
- Inspect all electrical equipment and tools before each use. Inspect insulation, fixtures, switches, plugs, fuses, etc. Remove from service any faulty equipment and notify the source of the equipment.
- Do not work with electrical equipment with wet hands or standing in wet areas.
- Only a qualified electrician should wire or install electrical systems.
- Ground fault circuit interrupters (GFCIs) should be provided for all areas where electrical equipment or portable electric tools may be used. If a GFCI outlet is not available, a portable GFCI outlet adapter or extension cord should be used (available from the equipment center).
- Do NOT use your finger or any conductive object to point to circuits, panels, fixtures, etc.
- Do not install fuses or circuit breakers larger than the circuit rating.
- Conduct a tool count before beginning work and after work is completed.
- Use lockout/tagout procedures whenever working on electrical equipment.
- Use only approved and properly rated lighting devices and tools in vessels, boilers, and confined spaces.
- Use the following precautions when using electrical cords:
  - Visually inspect electrical cords before each use for fraying, cuts, or other damage.
  - Do not use extension cords for permanent installations.
  - Keep extension cords properly covered or raised overhead to prevent tripping hazards and damage from traffic.
  - Extension cords or cables shall not be secured with staples, hung from nails, or suspended by bare wire.
  - Only use electrical cords that are equipped with a grounding pole on the plug (three pole plugs). Never remove a grounding pole from a cord.



- All electrical equipment, including motors, generators, wiring, and controls, should be installed so that exposed live parts are properly guarded or insulated to provide adequate protection to operating personnel. Avoid open panels, circuit boxes, and exposed wiring.
- Portable electrically driven tools must be grounded with a three-wire circuit. Explosion-safe (explosion-proof or intrinsically safe) tools are required in hazardous areas.
- In wet locations:
  - Plugs and receptacles shall be kept out of water unless they are an approved submersible type.
  - Where a receptacle is used in a wet location, it shall be contained in a weatherproof enclosure, the integrity of which is not affected when an attachment plug is inserted.
  - All temporary lighting strings in outdoor or wet locations (such as tunnels, culverts, valve pits, floating plants, etc.) shall consist of lamp sockets and connection plugs permanently molded to the hard service cord insulation.
- If a rescue from electrical equipment is required, use the following precautions:
  - Disconnect the circuit before attempting the rescue.
  - Make sure you are standing on a dry surface.
  - Use a dry belt, rope, coat, or other nonconductive material to loop over the victim and drag them away from the contact.
  - Assess the condition of the victim; do not approach if they are still in contact with the circuit.
  - Apply first aid and/or CPR (if you are qualified) and get medical help.

## 16.5 Lockout/Tagout

Although CDM employees normally oversee, rather than do, construction and maintenance work, they sometimes must examine, enter, or service mechanical equipment. In many cases, CDM employees must work in or around energy sources that are owned and operated by clients or a third party. **Any locks or tags CDM places on equipment owned and operated by an organization other than CDM must be coordinated with the owner/operator of the equipment.**

These guidelines cover inspecting, servicing, and maintaining equipment where unexpected energization or startup of the equipment has the potential to harm employees. These guidelines are intended to prevent accidents and injuries caused by the accidental release of energy.

### 16.5.1 Definitions

**Lockout** - The process of preventing the release of material or energy (mechanical, kinetic, potential, electrical, or chemical) from a power source using physical means, such as a lock to maintain an energy isolation device in the safe position, and prevent the inadvertent energization of machinery, equipment, or a system. Lockout usually involves installing a lock at a power (or flow) source so that equipment supplied by that source cannot be operated. Locks may be obtained from the equipment centers. The lockout locks are provided only for lockout purposes and should not be used to lock toolboxes, storage sheds, or other devices.

**Tagout** - Accomplished by placing a tag on the power source. The tag acts as a warning not to restore energy. It is not a physical restraint. Tags must clearly state **Do Not Operate** or the like. Identifying information must be applied by hand. CDM uses tagout as a complement to lockout, **not** as a substitute.

**Authorized Employees** - Those who physically lock or tagout equipment for servicing or maintenance. Note that these individuals are not necessarily the people who normally operate the equipment. In some cases, the authorized employee may be a representative of a client or third party operator.

**Affected Employees** - Those whose job requires them to operate equipment subject to lockout or tagout, or those employees who work in areas where lockout or tagout is used.

### 16.5.2 What Must Be Locked or Tagged Out?

Employees should implement these guidelines when they are potentially exposed to hazards such as unguarded moving parts, live electrical systems, or flow of material from open pipes, valves, or other systems. This program applies to nonroutine activities. This includes inspections, repair and replacement work, renovation work, and modifications or other adjustments to equipment that may affect CDM employees. For routine activities, mechanical guarding and electrical insulation are the preferred protection.

Some types of energy that lockout/tagout must be used to control include:

Electrical	Mechanical	Pneumatic
Fluids and gases	Hydraulic	Thermal
Gravity		

### 16.5.3 Client-Performed Lockout

In most cases, lockouts or tagouts should follow the procedures of the owner and operator because they are more likely to understand any special conditions that apply to their facility and its equipment. CDM should request that the operator either perform or oversee lockouts and tagouts for those work activities that require the lockout or tagout of equipment to protect CDM employees or subcontractors. CDM should request that its employees be allowed to place personal locks on systems under the client's procedures. CDM may rely on lockouts performed by client operators provided:

- The lockout follows an established procedure, as opposed to an improvised one. CDM should ask for and review the procedure before performing the work.
- The CDM employees observe the lockout and believe that it controls all harmful energies

The procedure below describes a procedure that CDM personnel should follow when they are responsible for the lockout.

### 16.5.4 Lockout/Tagout Procedure

When CDM employees perform a service that requires lockout or tagout, they must coordinate all activities with the operator of the facility. The following actions should be performed to execute a lockout or tagout:

- Shut down the equipment
- Isolate equipment
- Apply lockout devices or warning tags
- Release stored energy to achieve a "zero energy state"

**Shut the Equipment Down and Isolate It** - First, locate all energy sources that power the piece of equipment you will work on. Always look for hidden energy sources. Many machines have more than one power source, so you must study the machines and power sources involved. Notify any affected employees before you start a lockout procedure, then shut off each power and material feed to the equipment.

Every power source has its own procedure for shutoff. Shutoff may be accomplished by pulling a plug, opening a disconnect switch, removing a fuse, closing a valve, bleeding the line, or placing a block in the equipment. Generally, follow this sequence of events:

- Shut down the machine by following the normal method for shutdown.
- Turn off the energy at the main power source.

- Turn the machine switch back on to confirm that the power source has been deactivated.
- Attempt to restart the machine to guarantee that the power is shut off, then return the switch to the off position.

**Apply Lockout Devices** - Make absolutely sure the power cannot be supplied unless you know about it. If several people will work on a piece of equipment, each must apply his/her own lock. Use a **multiple lockout** device that can accommodate several locks at once. All personal locks shall be accompanied by a tag that identifies the employee(s), is signed and dated by the employee(s) and specifies the work activity being performed. This prevents any accidental startups while another employee may still be working on the machinery.

When all energy sources are locked, inform others of the lockout situation. One way to do this is by applying a tag to the power source. **Note:** Never use another employee's lock and never lend your lock to another employee.

**Safe Release of Stored Energy** - Equipment must be at "zero energy state" before servicing or maintenance work can begin. To achieve a zero energy state, release energy by draining valves, releasing springs, bleeding air or hydraulic pressure, or supporting elevated weights. When you are finished, test the machine to ensure that all energy was disconnected or released.

**Putting the Power Back On** - After servicing is finished, make sure all tools and personnel are removed from the area and replace all machine guards. Only then can you remove your tag and lock and reconnect all sources of energy. You may then restart the equipment in accordance with normal startup procedures.

### 16.5.5 Training and Inspections

**Training** - All affected CDM employees must be trained in the purpose and use of lockout and tagout before the effort begins. All authorized CDM employees will be trained in recognition of hazardous energy sources, hazardous energy sources in use, and how to follow the lockout/tagout procedure. CDM will conduct retraining when an audit shows deficiencies with the procedures or at the request of a division or resource manager.

**Inspections** - When these procedures are applied to a single site for more than a month, an inspection must be done by an authorized employee. This inspection should include questions to determine if employees understand the purpose of lockout/tagout, if proper locks and tags are being used, and if established procedures are being followed. Each inspection should be documented with a Lockout/Tagout Inspection Form found in Exhibit 16-A of this section.

### 16.5.6 Special Conditions

**Other Contractors** - Contractors and facility operators should inform each other of their lockout/tagout procedures in enough detail for their employees to recognize the function of locks or tags that they may observe during their work. If CDM finds locks or tags on equipment that is related to neither CDM nor client work, the project

manager or site supervisor should notify the client. Work should not proceed until the need, function, and ownership of all locks or tags are clarified. Under no circumstance may CDM employees or subcontractors remove locks or tags not placed by CDM or its subcontractors.

**Shift and Personnel Changes** - The employees ending their shift should remove their locks before leaving. However, they may only remove their lock if it is safe to operate the equipment or another lock is put in place that is under the control of someone on the next shift. When a piece of equipment will remain unsafe until the employee next returns, that lock may remain in place.

**Power Sources that Cannot be Locked Out** - When a power source cannot be physically locked out, a tagout may be used without locks.

**Plug-Supplied Equipment** - Any CDM employee who works on an appliance or device that obtains its power through a flexible cord must apply a plug lockout device to its attachment plug or keep the plug in his or her control throughout that effort.

## Exhibit 16-A Lockout/Tagout Inspection Form

Project Name: \_\_\_\_\_ Project Number: \_\_\_\_\_

1. Inspection Conducted by: \_\_\_\_\_ on \_\_\_\_\_
2. Machines/Equipment/Operation Inspected: \_\_\_\_\_  
\_\_\_\_\_
3. Names of Employees Observed: \_\_\_\_\_  
\_\_\_\_\_
4. Deficiencies Noted: \_\_\_\_\_  
\_\_\_\_\_
5. Corrective Action Taken: \_\_\_\_\_  
\_\_\_\_\_

- |   | YES   | NO    |
|---|-------|-------|
| 6. Have employees (contractors) been trained/instructed in our lockout procedure?   | _____ | _____ |
| 7. Are the lock and/or tag devices authorized by the company procedure?   | _____ | _____ |
| 8. Are all effected employees (contractors) notified that a lockout is required and the reason for it?  | _____ | _____ |
| 9. Is equipment being shut down by required shutdown procedure?   | _____ | _____ |
| 10. Are the switches, valves, or other energy isolating devices disconnected or isolated from the equipment?  | _____ | _____ |
| 11. Are the energy isolating devices located out/tagged out by an authorized employee's individual lock/tag?  | _____ | _____ |
| 12. Are the push buttons or other normal operating controls checked to see if the energy sources are disconnected and that the equipment cannot operate?  | _____ | _____ |
| 13. Upon completion, are equipment areas checked to see that no personnel are in the area and all locks/tags are removed?   | _____ | _____ |
| 14. If more than one individual is required to lockout equipment, does each person place his/her own personal lock/tag on the energy isolating device(s)? or Are all steps of group lockout/tagout procedures observed? | _____ | _____ |
| 15. If an employee or contractor is not available to clear his/her lock/tag, does the supervisor remove the lock/tag after taking all the precautions listed in the lockout/tagout program?                             | _____ | _____ |

## 16.7 Fall Protection

Camp Dresser & McKee Inc. (CDM) employees who visit active construction sites may be exposed to falls. A fall exposure is considered to exist when an employee is within 6 lateral feet of a change in elevation of 6 vertical feet or more. Typical exposures can include:

- Excavations
- Roofs
- Leading edge of a surface (floor)
- Floor openings

All employees should use fall protection 100 percent of the time when exposed to a fall in excess of six feet or when required by rules such as those of a client or the owner or operator of a facility. Fall protection may consist of any of the following:

- Guardrails
- Safety Nets
- Positioning Systems
- Warning Systems
- Personal Fall Arrest Systems

*Employees should not use fall arrest equipment until they have been properly trained. Fall protection training can be arranged by contacting your division HSM. Project managers and site managers shall ensure fall protection is available and used as required for all employees for whom they are responsible and that employees receive adequate training in the use of the equipment.*

The following work practices and guidelines should be considered for protection against falls:

- Before working or walking on a surface, consider the strength and structural integrity of the surface. Can it support employees and any needed equipment or material safely? Employees shall work on those surfaces only when the surfaces have the requisite strength and structural integrity.
- When not protected by any other means of fall protection, such as safety nets or scaffold with proper guardrails, employees shall use full body harnesses, lanyards with double-locking snap hooks, and an adequate anchorage (fall arrest equipment). To achieve 100 percent fall protection, employees may need to use a two-lanyard system and/or vertical or horizontal lifelines, retractable lifelines, or other approved positioning devices.

- Employees shall rig fall arrest equipment so that it minimizes the potential for a fall arrest event or any potential free fall, lateral swing, or contact with any lower object. Under no circumstances shall fall arrest equipment be rigged so that an employee can free fall more than 6 feet.
- Anchorage points for fall arrest equipment shall be capable of supporting 5,000 lbs per employee attached. Anchorage points for fall arrest equipment shall be located above the employee's body harness attachment point where practical.
- When vertical lifelines are used, a separate lifeline shall protect each employee. The lifeline shall be properly weighted at the bottom and terminated to preclude a device such as a rope grab from falling off the line.
- Horizontal lifelines should be limited to two persons at one time between supports and maintain a safety factor (strength / requirement) of at least two.
- Before each use, employees shall visually inspect all fall arrest equipment for cuts, cracks, tears or abrasions, undue stretching, overall deterioration, mildew, operational defects, heat damage, or acid or other corrosion. Equipment showing any defect shall be withdrawn from service. All fall arrest equipment subjected to impacts caused by a free fall or by testing shall be removed from service. CDM personnel shall use full body harnesses for personal fall protection. Fall protection equipment is available from the field equipment centers.
- Fall arrest equipment should be stored in a cool dry place not subjected to direct sunlight.
- Fall arrest equipment shall not be used for any other purpose, such as towropes or hoist lines.
- Proper guardrails shall be installed on open sides of all walkways and runways where the fall distance exceeds 4 feet. Proper guardrails shall be installed on open sided floors where the fall distance exceeds 6 feet. All floor openings or floor holes shall be protected by guardrails or hole covers. If hole covers are used, they shall be strong enough to support the maximum intended load, secured against displacement, and properly labeled.
- When guardrails are used for fall protection, they shall consist of a top rail, intermediate rail, and toe board. The top rail shall have a vertical height of 42 inches; the midrail shall be at 21 inches, and the toe board 4 inches. When wood railings are used, the post shall be of at least 2 inch by 4 inch stock spaced not to exceed 8 feet, the top rail shall be of at least 2 inch by 4 inch stock, and the intermediate rail shall be of at least 1 inch by 6 inch stock. If pipe is used, it shall be at least 1 ½ inch nominal diameter. If structural steel is used, it shall be of 2 inch by 2 inch by 3/8-inch angles or equivalent. If wire rope is used for railings, it shall have a diameter of at least 2 inch and shall be stretched taut to allow no more than a 3 inch deflection.



- When operating a scissor-lift work platform, the lift shall have guardrails on all open sides, with the door access chains or rails in place.
- Employees operating aerial lifts shall wear a body harness and lanyard attached to the aerial lift. Employees shall not attach the lanyard to an independent structure.
- Employees riding in a crane-suspended work platform shall wear a body harness and lanyard attached to the grab rail of the platform.
- Employees working on or near wall forms or rebar shall wear a body harness lanyard and/or positioning device when exposed to a fall in excess of 6 feet.
- Positioning devices shall be rigged to prevent a free fall greater than 24 inches.
- Stairs, ladders, or ramps shall be provided for all access ways where there is a change in elevation greater than 19 inches.
- Manila or synthetic rope shall not be used as guardrails.
- Employees shall not stand or sit on guardrails.
- Personal fall arrest systems shall not be attached to guardrail systems.
- If warning lines are used, they should consist of rope, wire, or chain, and be flagged at intervals of 6 feet or less with high-visibility material. The lowest point should be no less and 34 inches from the surface and the highest point should be no more than 39 inches. The warning line should be placed at least 6 feet from the edge.
- Safety net systems should be installed as close to the working surface as practical, but in no case more than 25 feet below the working surface and should extend outward at least 8 –13 feet depending on the vertical fall distance. Safety nets should be drop-tested after initial installation and at 6-month intervals. The maximum size of net mesh should not exceed 36 square inches nor be longer than 6 inches on any side. Mesh opening should be secure to prevent enlargement.
- Body belts should not be used for personal fall arrest. Full body harnesses are required.

## 16.8 Excavations

Camp Dresser & McKee Inc. (CDM) employees who work in or around excavations are exposed to many of the same excavation hazards as construction personnel. CDM employees should learn to recognize these hazards and avoid situations that put themselves, other employees, and subcontractors, at risk. Employees should be aware of the following safe excavation work practices.

### 16.8.1 Pre-Excavation Activities

- Before excavation, the location of any underground utilities such as gas, sewer, electricity, and telephone lines should be determined and marked. In public areas, this can be done using the state's one call system for utility location. On private property, government facilities, etc., the owner must be asked to locate underground utilities. In some cases, it may be necessary to use non-intrusive sub-surface investigation techniques to identify underground utilities and installations.
- Excavations should be conducted under the direction of a "competent person." OSHA defines "competent person" as an individual who, by way of training and/or experience, is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, is designated by the employer, and has authority to take appropriate actions. For excavations, the competent person should be on site and is responsible for ensuring the following:
  - Performing inspections prior to the start of each shift as needed throughout the shift to ensure a safe operation.
  - Removing employees from the hazardous area when there is evidence of a possible cave-in.
  - Identifying and correcting hazards associated with the excavation.
- Sometimes, the excavation is under control of CDM, and CDM should provide the competent person. Often, the excavation is under the control of a contractor, and that contractor should provide the competent person.
- For many excavations, an excavation permit must be completed before excavating. The permit is usually generated by the owner/operator of a facility or sometimes a prime contractor. The permit should be completed by the competent person for that excavation.
- Surface encumbrances (buildings, utility poles, pavement, or other structures that may be undermined by the excavation) that have a potential to create a hazard to employees or become subject to physical damage must be removed, supported, or neutralized, as necessary, prior to the start of any excavation work.
- The competent person must evaluate soil conditions and determine the shoring or sloping requirements for the trench or excavation, based on the soil evaluation. If

no attempt is made to determine soil type, excavations shall be sloped at an angle not steeper than 1.5 (horizontal) to one (vertical) (34 degrees), or a trench box or other protective system shall be used. For excavations greater than 20 feet (6 m) in depth, sloping and/or shoring systems must be designed by a professional engineer.

## 16.8.2 During Excavation

- The competent person must inspect the trench or excavation daily before performing any work within the trench or excavation deeper than 5 feet.
- For trenches less than 5 feet deep, the competent person must inspect and evaluate the potential for a cave-in.
- All excavations that are 4 feet deep or deeper shall have a ladder for access into the excavation with no more than 25 feet of lateral travel in any direction.
- All excavations that are 5 feet deep or deeper, and excavations shallower than five feet in unstable soil shall be sloped, braced, or shored to prevent cave-ins.
- No material, including trench spoil, may be stored within 2 feet of the edge of the excavation.
- All excavations shall be barricaded with the appropriate barrier tape and other protective devices to protect against falls or other inadvertent entry.
- If possible, excavations should not be left open. If an excavation must be kept open, proper covers, fencing, and security should be provided to prevent public access to the excavation during non-working hours.
- Tools, equipment, or heavy machinery should not be placed near an excavation where they may affect the structural stability of the walls or fall into the excavation.
- When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system, such as barricades, hand or mechanical signals, or stop logs, should be utilized. Where possible, the grade should slope away from the excavation.
- An emergency lighting system should be in place in the event of an electrical failure. This may consist of battery-operated flashlights.
- If employees or small equipment must cross over the excavation, provide walkways or bridges with a minimum clear width of 20 inches, equipped with standard rails, and extending a minimum of 24 inches past each surface edge of the trench.

- For excavation work adjacent to natural waterways, avoid polluting of the water by placing spoil piles away from the water and preventing any accumulation of spoils on slopes.
- Place any environmentally impacted soils on plastic liners and cover the spoil piles to prevent further spreading of the contamination. The liners and covers should be durable enough for the intended period of storage.
- For excavations that may contain a hazardous atmosphere, air monitoring should be conducted prior to entry and periodically during the work to ensure that a safe atmosphere is maintained during excavation work. Air monitoring shall be performed for explosive/flammable vapors, oxygen, and any hazardous gases that may be present such as hydrogen sulfide, carbon monoxide, or other hazardous gases that may be present due to activities conducted in the excavation or contaminants in the soil. Use forced ventilation if needed. Acceptable entry conditions are:
  - Oxygen content                      20.5% to 23.5%
  - Flammable atmosphere              < 10% of the Lower Explosive Limit
  - Hydrogen Sulfide                      < 10 ppm
  - Carbon monoxide                      < 25 ppm
  - Toxic Vapor/Gases                      < one half compound exposure limit

Note: If air monitoring results indicate levels outside of the conditions above, CDM employees and subcontractors should not enter the excavation and contact the safety coordinator or HSM for guidance.

- Heavy equipment, tools, or individuals shall not operate/work within 10 feet of any power line or exposed electrical distribution component unless it has been de-energized and visibly grounded or provided with an effective insulating barrier.
- Workers should wear personal protective equipment including a hard hat, safety glasses, and safety boots.
- Water accumulation is not permitted in any excavation that will be occupied. Remove standing water using pumps and continuously monitor the water level and pump operation.
- The competent person must evaluate soil conditions and stability as new soil layers are uncovered.
- Do not stand under any live load, including an excavator bucket

- Stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.
- Do not stand in the swing radius of excavation equipment.

## 16.9 Ladders

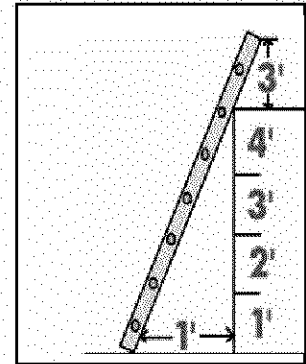
The following guidelines should be followed by Camp Dresser & McKee Inc. (CDM) employees when using ladders.

### 16.9.1 Portable Ladders

- Ladders should be used to travel from one elevation to another. Except where it is not feasible, work should not be performed from ladders. When it is necessary to perform work at high elevation, scaffolds or mobile lift equipment should be used.
- If it is necessary to work from a ladder:
  - The ladder must be secured to prevent it from slipping or falling.
  - When possible, employees working more than 6 feet above grade should wear a body harness and lanyard, and tie off to a secure anchor, (Not the ladder!) or have another employee hold the ladder.
- Before using any ladder it should be inspected. Look for :
  - Missing non-skid feet.
  - Worn or frayed ropes.
  - Cracks in sides or rungs.
  - Missing rivets or other fasteners.
  - Bent or missing spreaders.
  - Bowed or distorted members.
  - Loose rungs.
  - Any condition that could cause a safety problem.
  - Ladders that have fallen or been misused should be checked for excessive dents or damage. Ensure that tie-off rope is attached and in good condition.
  - Ensure that the spreaders and locking mechanisms on stepladders are in good condition.
  - Ensure that hinges move easily and are in good condition.
- Ladders should not be painted. Paint can hide damage and defects.
- Select the correct type of ladder for the job. Only fiberglass ladders should be used at electricity-generating facilities. Only non-conductive ladders should be used for work involving electricity or the use of electrically powered tools. Make sure the

ladder is long enough to reach the desired point without compromising recommended safe use-procedures.

- Secure ladders by tying the top or bottom to a fixed structure that will support more than the anticipated total load. Maintain an adequate slope with the base at least one quarter of the length of the ladder away from the supporting structure.
- The ladder should extend 3 feet above any landing you will access.
- Do not leave unattended step or straight ladders standing. They should be closed, lowered to the ground, and placed where they do not present tripping hazards.
- Keep the area around the base and top of the ladder free of tripping hazards, and barricade the area if the base or top projects into a passageway.
- When either the length or the weight of a ladder makes it difficult to handle, two people should raise and secure the ladder. One should secure the feet while the other walks under the ladder from the opposite end until it is raised enough to place or move. Raise the extension, if needed. Reverse the process for lowering the ladder.
- Extension ladders must be equipped with necessary irons, locks, and hooks and assembled so the sliding (upper) section is on top of the base (lower) section. In addition, extension ladder sections should overlap at least 3 feet. If the ladder extends more than 4 feet above the top tie-off, place a barrier or flag on the ladder to prevent personnel from climbing beyond a safe point.
- Ensure that shoes/boots are free of mud, oil, or grease before ascending or descending a ladder. Ladder rungs must be cleaned immediately if they become soiled to reduce slipping hazards.
- Employees should use a tool pouch or bucket-and-line to raise or lower materials, rather than carrying them while ascending or descending a ladder.
- Only one employee may climb or descend a ladder at a time.
- When climbing or descending a ladder, face the ladder and maintain three points of contact at all times. (ie., 2 feet and 1 hand, 2 hands and 1 foot.)
- Straight ladders should not be climbed beyond the third step from the top.
- Excavations and trenches more than 4 feet deep should have a ladder (or ladders) that extends at least 3 feet above the ground surface placed so that personnel will not travel more than 25 feet horizontally to get to a ladder.



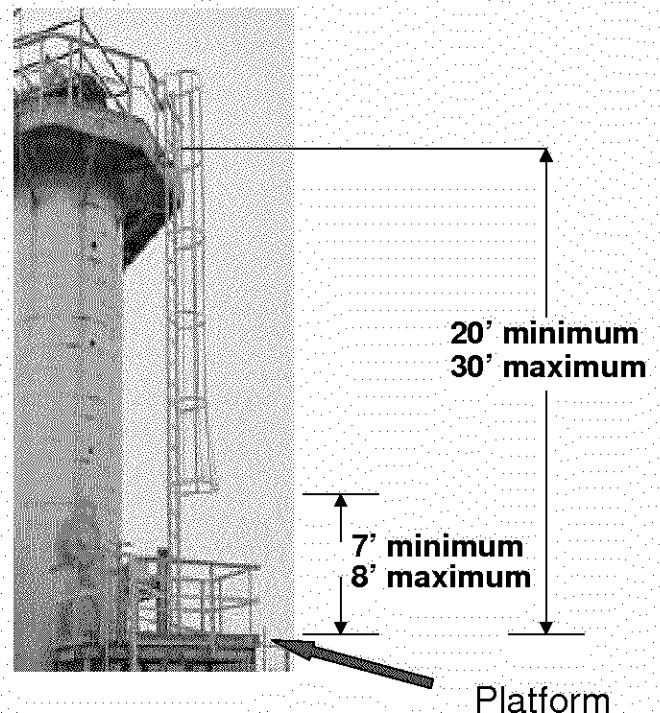
- When storing ladders, take the following precautions:
  - Ladders stored horizontally should have support in a sufficient number of places to prevent sagging and permanent set.
  - Tie together or secure ladders that are stored vertically to keep them from falling into aisles or equipment.
  - Do not store wooden ladders near radiators, stoves, or other heat sources that could dry the wood and cause deterioration.
  - Do not store wooden ladders near steam lines or other places where they are kept wet or damp enough to rot wood.
  - Clean ladders after every use before returning them to storage. Remove all mud, oil, and grease.

### 16.9.2 Stepladders

- Stepladder legs should be fully spread with the spreader bars locked in place.
- Stepladders should not be used as straight ladders.
- The top two steps should not be used.
- Do not leave tools or materials on the top shelf of a stepladder, remove them before descending a ladder and/or moving it.

### 16.9.3 Fixed Ladders

- Fixed ladders more than 20 feet high must be caged unless other fall prevention safety devices are installed and used. Fixed ladders with cages exceeding 20 feet in height shall have landing platforms installed every 30 feet. Use of the body harness and lanyard described in Section 16.9.1 would meet this requirement.
- Fixed ladders should be securely attached to an immobile structure and attachments should be inspected annually for signs of deterioration or detachment. Repairs must be made immediately.





## **16.12 Tools and Power Equipment**

### **16.12.1 Hand Tools**

Camp Dresser & McKee Inc. (CDM) employees who have a need to use basic hand tools should use the following work practices:

- All tools used on CDM projects, regardless of ownership, shall be of an approved type and maintained in good condition. Tools are subject to inspection at any time. The project manager has the authority and responsibility to condemn unserviceable tools, regardless of ownership.
- Tag defective tools to prevent their use or removal from the job site.
- Use the proper tool for the job performed.
- Don't use hammers with metal handles, screwdrivers, knives with metal continuing through the handle, and metallic measuring tapes on or near energized electrical circuits or equipment.
- Do not throw tools from place to place or from person to person; tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
- Do not place tools unsecured on elevated places.
- Dress, repair, or replace all impact tools such as chisels, punches, drift pins, etc., that become mushroomed or cracked before further use.
- Use suitable holders or tongs to hold chisels, drills, punches, ground rods, or pipes that are struck by another employee, not the hands.
- Do not use shims to make a wrench fit.
- Do not use wrenches with sprung or damaged jaws.
- Do not use pipe or other means to extend a wrench handle for added leverage unless the wrench was designed for such use.
- Use tools only for the purposes for which they have been designed.
- Store and handle tools with sharp edges so that they will not cause injury or damage. They shall not be carried in pockets.
- Use eye protection when using or working around impact type tools. (e.g., hammer, chisel, ax, hatchet, etc.)
- Replace wooden handles that are loose, cracked, or splintered. The handle shall not be taped, glued, or lashed with wire.

- Keep all cutting tools such as saws, wood chisels, knives, or axes in suitable guards or in special compartments.
- When using such tools as screwdrivers and wrenches, avoid using your wrists in a bent, flexed, extended, or twisted position for long periods of time. Employees should maintain their wrists in a neutral or straight position.
- Do not leave tools lying around where they may cause a person to trip or stumble.
- When working on or above open grating, use a canvas or other suitable covering to cover the grating to prevent tools or parts from dropping to a lower level where others are present, or barricade or guard the danger area.
- Do not depend on the insulation on hand tools to protect users from shock.

### **16.12.2 Electric Tools**

CDM employees who have a need to use electric power tools should use the following work practices:

- The non-current carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless the tool is an approved double-insulated type, or the tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24-volt DC system.
- All power tools shall be examined before use to ensure general serviceability and the presence of all applicable safety devices. The electric cord and components shall be given a thorough examination for cracks, exposed wires or other defects.
- Power tools shall be used only within their capability and shall be operated in accordance with the manufacturers' instructions.
- The use of eye protection is required when using or working around power tools.
- Operators should take care to use appropriate hand positions on cutting tools such as saws, drills, grinders, etc. to avoid hand injury.
- All tools shall be kept in good repair and disconnected from the power source while repairs are being made.
- Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts, until that hazard is firmly under control.
- Ground fault circuit interrupters (GFCI) should be used with all electric power tools.
- All guards and safety interlocks with which the tools were purchased shall be in place and in working order.

- Any tool that is identified as defective should be tagged "not for use", and set aside for repair and/or discarded.
- Do not wear loose or frayed clothing while operating power tools and equipment. Hair should not stick out from hard hats.
- Do not use electrical cords to transport, suspend, hoist, or lower tools.
- Do not allow power cords to lie in water.
- Disconnect rotating tools from the power source before adjusting, servicing, or cleaning them. Follow the lockout procedure described in section 16.5.
- Do not modify tools.

### **16.12.3      Pneumatic Tools**

CDM employees that use pneumatic power tools should use the following work practices:

- Compressed air and compressed air tools shall be used with caution.
- Pneumatic tools shall never be pointed at another person.
- Pneumatic hose connections should be secured by some positive means to prevent them from becoming accidentally disconnected. Chicago fittings have wire holes to allow such security.
- Pneumatic power tools shall be secured to the hose by some positive means to prevent the tool from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact tools to prevent attachments from being accidentally expelled.
- Compressed air shall not be used for cleaning purposes except when reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.
- Compressed air shall not be used to blow dust or dirt from clothing (or skin).
- The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
- The use of hoses for hoisting or lowering tools shall not be permitted.
- All compressed air hoses exceeding 30 psi shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure or disengagement of a connection.

- Before making adjustments or changing air tools, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection. Disconnection at the quick-change connectors is one way to meet this goal.
- Eye protection is required when using or working around pneumatic tools.
- Use hearing protection if noise exposure is a concern, (i.e., if it is too loud to conduct a normal conversation).
- Pneumatic tools shall be operated only by persons trained in their use.
- A pneumatic tool used where it may contact exposed live electrical parts shall have a nonconductive hose and an accumulator to collect moisture.
- Employees shall not use any part of their bodies to locate or attempt to stop an air leak.
- All guards and safety interlocks must be in place and functional.

#### **16.12.4 Engine-Powered Tools**

- Stop the engine and allow it to cool before refueling, servicing, or maintenance.
- Use care in refueling. Clean up any small spills of fuel or oil immediately.
- The use of eye protection is required when using or working around engine - powered tools.
- Use hearing protection if noise exposure is a concern, (i.e., if it is too loud to conduct a normal conversation).
- If possible, disconnect the spark plug before performing an adjustment, maintenance or service.
- Use tools in well-ventilated areas to eliminate any accumulation of fumes.
- Do not use tools in a flammable or explosive atmosphere.
- Equip engines with spark-arresting mufflers.
- Avoid contact with hot engine components.
- All guards and safety interlocks should be in place and functional.

## 16.13 Heat Stress

Camp Dresser & McKee Inc. (CDM) employees may be exposed to hazards associated with hot work environments. Factors that contribute to heat exposure include temperature, humidity, personal protective equipment (PPE) radiant heat, sunlight, access to drinking water, exposure duration, and work activity. Individuals vary widely in their susceptibility to heat stress. Factors that may influence individual susceptibility to heat stress include the following:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

The following guidelines should be considered when CDM employees or subcontractors perform work:

- In ambient air temperatures above 80 ° F
- That involves heavy physical labor in temperatures above 70 ° F
- In chemical-protective clothing above 70 ° F.

### 16.13.1 Hazards Associated With Heat Stress

**Heat Stroke** – Heat stroke is a serious medical emergency and can lead to death if left untreated. It is an acute and dangerous reaction caused by the failure of heat regulating mechanisms of the body. Persons who are elderly, obese, chronically ill, alcoholic, diabetic, or have circulatory system problems are at greater risk.

- Symptoms include red, hot, dry skin, nausea, headache, weakness, dizziness, elevated body temperature, rapid respiration and pulse, coma, or loss of consciousness.
- Treatment for heat stroke:

- Heat stroke is a serious medical emergency. Emergency medical services (911) should be contacted if heat stroke is suspected.
- Move the victim to a cool place, (shade, air conditioned building, vehicle).
- Remove heavy clothing.
- Cool the victim with ice packs, wet towels, or cloth.
- Keep head and shoulders elevated.
- Keep victim's airway open, check breathing and pulse.

**Heat Exhaustion** – A state of exhaustion or weakness caused by loss of fluids through perspiration and inadequate fluid replacement. Severe cases may result in loss of consciousness, (fainting). This condition can progress to heat stroke if left untreated.

- Symptoms include:
  - Pale, clammy, moist skin, heavy sweating, and extreme weakness.
  - Body temperature is normal, pulse is weak and rapid, breathing is shallow.
  - The person may have a headache, nausea, or feel dizzy.
- Treatment for heat exhaustion:
  - Remove the victim to a cool location. (e.g., shade, air conditioned building, or vehicle).
  - Allow the victim to lie down and prop their legs up.
  - Cool the victim with wet towels, cloth, or cold packs.
  - If the victim is not nauseous they should drink water slowly.
  - If the victim loses consciousness, transport to local medical facility.
  - Continue treatment until symptoms are gone. Consult with CDM medical consultant prior to returning to work.

**Heat Cramps** – Heat cramps are a condition that can progress to heat exhaustion or heat stroke. Symptoms include severe cramping of the arms, legs, and abdomen. Treatment includes:

- Removing the victim to a cool location. Loosen clothing.
- Having the victim slowly drink cool water.

- Resting the cramping muscles.

**Heat Rash** – Heat rash is a mild red skin rash, in areas where the body is in contact with clothing or protective gear. The area is likely to itch and can be a source of irritation. Treatment includes decreasing the amount of time in protective gear and applying talcum powder to absorb moisture. When possible, wear breathable clothing to prevent a buildup of moisture within the clothing.

### 16.13.2 Heat Stress Monitoring

Since the susceptibility to heat stress hazards can vary greatly from one individual to another, often the best way monitor for heat stress is through observing employees and individual physiological monitoring. When working in conditions that have the potential to create heat stress, either heart rate (HR) or body temperature (BT) should be monitored in accordance with the suggested frequency given in Table 16-1 below:

**Table 16-1 Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers<sup>a</sup>**

Adjusted Temperature <sup>b</sup>	Normal Work Ensemble <sup>c</sup>	Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

<sup>a</sup>For work levels of 250 kilocalories/hour.

<sup>b</sup>Calculate the adjusted air temperature ( $T_a$  adj) by using this equation:  $T_a \text{ adj } ^\circ\text{F} = t_a ^\circ\text{F} + (13 \times \% \text{ sunshine})$ . Measure air temperature ( $T_a$ ) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow, (100 percent sunshine - no cloud cover and a sharp, distinct shadow; 0 percent sunshine - no shadows).

<sup>c</sup>A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

- **Heart Rate (HR)** – Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the initial rest period. On an individual basis, if the heart rate exceeds 110 beats per minute (BPM), that individual should not return to work until their heart rate drops below 110 BPM and they are fully recovered. If more than one worker has a heart rate that exceeds 110 BPM, a work rest regimen, or other control measures should be implemented to maintain heart rates below 110 BPM.
- **Body Temperature (BT)** – The body temperature may be measured using a clinical oral thermometer or a clinical ear thermometer. On an individual basis, if the body temperature exceeds 99.6 ° F, that individual should not return to work until their body temperature drops below 99.6 ° F and they are fully recovered. If more

than one worker has a body temperature in excess of 99.6 ° F, a work rest regimen, or other control measures should be implemented to maintain body temperatures below 99.6 ° F.

- Personnel should monitor themselves and each other for the development of symptoms such as sudden fatigue, nausea, dizziness, irritability, malaise, flu-like symptoms, and lightheadedness.

### **16.13.3 Heat Stress Controls and Prevention**

- Develop work/rest regimen to maintain physiological parameters within limits described above and prevent development of initial symptoms of heat stress-related conditions. If the physiological limits are exceeded or symptoms develop, the work period should be reduced and rest period increased. Rest areas should be cool, in areas such as shade, air conditioned buildings, or vehicles, and away from heat exposure.
- In extreme heat conditions, employees may wear heat-control clothing such as ice vests or cool suits. Physiological monitoring should still be conducted and work/rest regimens implemented to keep physiological parameters within recommended limits.
- Mobile showers or hoses can be used to cool down workers in waterproof protective clothing.
- Shield sources of radiant heat.
- Provide shaded work areas.
- Conduct activities in early morning and late evening to avoid the hottest parts of the day.
- Allow employees to become acclimatized to the heat by performing less strenuous activities for the first few days. Schedule more physically demanding work later.
- Provide adequate, cool drinking water for consumption during break periods.
- Avoid consumption of beverages such as coffee, tea, or colas that act as diuretics and dehydrate the body.



## 16.15 Working Around Heavy Equipment

Good work practices while working around heavy equipment include:

- Assume the operator cannot see you. The operator's vision may be blocked by blind spots. He or she is frequently concentrating on their work and equipment and may not notice a site visitor.
- If you must approach the operator, be sure you have made eye contact with the operator and they know you will be approaching them before approaching the equipment. Verbal contact, direct or by radio, is even better. Do not approach if the equipment is moving or in operation.
- Stay clear of pinch points and swing areas of equipment. On Camp Dresser & McKee Inc. (CDM) projects, these areas should be taped or barricaded off, but when equipment moves frequently, you can't count on other organizations to mark these zones.
- Do not walk near a moving piece of equipment. It could turn or rotate any minute. Modern construction equipment moves fast and in any direction.
- On a noisy site, you may not notice the equipment's back-up alarm. Keep aware of what is happening around you.
- Never walk under a load on a crane or hoist. Indeed, avoid the area under the hook or bucket
- Do not cut across the path of equipment backing up.
- Wear your hardhat and safety glasses. The safety glasses protect your eyes from dust and debris and the hardhat provides protection for your head and makes you more visible on the site.
- On sites where there is frequent vehicle or construction equipment movement, wear high-visibility clothing.
- Maintain a clearance of at least 10 feet between any part of the machine or its load and any electrical line or apparatus carrying up to 50,000 volts. One foot of additional clearance is required for every additional 30,000 volts.

## 16.18 Safety Working Around Drill Rigs

The use of mechanical drill rigs to collect soil samples and install monitoring wells presents significant hazards to operators, helpers, as well as technicians and engineers who may work in proximity to such rigs. Camp Dresser & McKee Inc. (CDM) employees that manage or oversee drilling operations should be aware of the basic hazards of drilling equipment and operations and have an awareness of safe drilling work practices. The guidelines and work practices described below should be implemented on all projects where mechanical drill rigs are used.

### 16.18.1 Preparation

- Contract documentation with drillers contracted with CDM should include CDM's standard contract between "Engineer & Subcontractor for Drilling Services," and "Health and Safety Protocol for Subcontractors" available on the Office of General Council's page of contract forms at <http://cdmweb/legalforms/inc.htm>.
- Before drilling or other sub-surface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or magnetometer studies may be needed to identify the location of underground obstructions.
- The work area for the drill rig and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.
- Prior to rig set-up the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines etc.
- OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, one foot of additional clearance is required for every additional 30,000 volts.
- If working in an area of moving vehicular traffic, appropriate traffic control systems should be in place. Contact local police or traffic control officer, before placing any traffic control equipment. See Section 16.22.
- Define an exclusion zone around the drill rig that is at least 1.5 times the height of the mast. Only personnel necessary for the immediate task being performed should be inside the exclusion zone.

### 16.18.2 Drill Rig Inspection

- After the rig is set up, but prior to operation, the work area should be inspected for eye, bump, and tripping hazards.

- The driller should inspect the rig daily prior to operation of the rig. The inspection should include the following:
  - Condition of the vehicle itself. Brakes should work and tires should have adequate tread. It should have a back-up alarm. If it is driven over the road, it should have all necessary brake lights, headlights, horn, license plates, etc.
  - All welds should be solid with no sign of visible cracks.
  - All gauges should be functional and legible.
  - All machine guards should be in place.
  - Emergency kill switches should be functional. All site personnel should be aware of the location and function of the kill switches. Have the driller review these with site personnel.
  - Cable and wire rope should be inspected for fraying, decay, “bird caging,” broken strands, kinking or flattening.
  - All hoses should be secure and in good shape. They should not be loose, bulging, or leaking.
  - High-pressure fittings should be secure and have whip checks (A pin or wire to prevent the hose whipping in the event of a failure of the connection).
  - High-pressure relief valves should be in working order.
  - Wire rope loops should be secure with at least two clamps.
  - The rig should have a fire extinguisher and first aid kit.
  - All tools should be clean and in good working condition. Hooks, eyes, pins, etc. should not be corroded or bent. Rod clamps should be in good condition.
  - If a cathead is used, it should be clean and free of burrs. The cathead rope should be in good condition and not be frayed or have excessive wear.
  - Back-up alarms should be functional.
  - Vehicles should have all lug nuts and they should all be tight.

### 16.18.3 Work Practices

- All personnel working around drilling operations should wear appropriate personal protective equipment including a hard hat, safety glasses, and hard-toed work boots.
- Drill crews should wear work gloves.

- On hazardous waste sites, additional PPE such as respirators, protective clothing, gloves, etc. may also be required.
- In areas where there is vehicular traffic, personnel should also wear high-visibility vests or clothing.
- Maintain an organized work area free from tripping hazards.
- Drill rods or other equipment should not be stored leaning up against equipment.
- Drill holes should be completed or secured before leaving the site for the day. Drill holes should not be left open at an unattended site.
- Boring locations should be placed to minimize the possibility of contacting underground utilities or structures. Clearance should be obtained from the site project manager before drilling begins.
- Do not move the rig with the mast in the upright position.
- Use a spotter when moving the rig from one location to another on the site.
- When sampling activities require working in proximity with heavy equipment or drill rigs, sampling personnel will stand clear of the equipment until sampling is required. They will notify the operator they are going to take a sample and must receive acknowledgment from the operator.
- Do not wear loose clothing such as hooded sweatshirts, parkas, or clothing with hanging drawstrings around drill rigs.
- Monitor weather conditions. Drilling operations should be terminated and the area near the drill rig evacuated during high winds and or storms with the potential for lightning strikes. The lead driller should be consulted to help assess if weather conditions are safe for drilling.
- Drill crew personnel should wear a personal fall arrest harness, connected to a secure tie-off point, when climbing the mast or working where fall exposures exceed 6 feet.
- Hearing protection should be worn during operations that produce significant noise exposures. (If you cannot hold a conversation using a normal voice with someone within 3 feet of you because of background noise, the use of personal hearing protection is recommended.)

## 16.20 Hazardous Waste Site Controls

Work sites designated as Hazardous Waste Sites must control access to the work area to only authorized personnel and conform to general work practices expected at hazardous waste site operations as required by the OSHA Standard for Hazardous Waste Operations, 29 CFR 1910.120. The following concepts should be reflected in the health and safety plan for the project.

### 16.20.1 Access Control

Controlled access to hazardous waste site work areas is required to protect personnel working on the site as well as to limit the potential for transporting contaminants off site. Depending on the size of the work site, hazards and contaminants present, and complexity of the work, access control may range from verbally cautioning non-authorized personnel to stay away from the work area, to a program including site security, signs, or formal sign in and sign out procedures. Details of site-specific access control procedures should be included in the site-specific health and safety plan. Some general work practices for access control are noted below:

**For small-scale site investigations** that are short-term projects (i.e. days not weeks or months), identify a work area to the work crew and keep persons not associated with the job site out of the work area. If the site is in an area where non-authorized persons are likely to be encountered, traffic cones, caution tape, and signs identifying the area as a controlled access area may be used.

**For more extensive projects** where work may be done for weeks or longer, the team the should deploy more extensive access controls. They should:

- Set up physical barriers and hire security personnel to prevent non-authorized persons from entering the work site.
- Keep the number of personnel and equipment on site to the minimum required to do the project effectively and safely.
- Establish work zones within the site,( see the next section- work zones).
- Establish controlled access points to be used by authorized personnel.
- Track the entry and exit of personnel through a check-in, checkout system.
- Establish a formal decontamination corridor from exclusion zones.

### 16.20.2 Work Zones

Field project managers, working under health and safety plans for hazardous waste operations are required to establish work zones to prevent or reduce the spread of site contaminants to non-contaminated areas on or off site. Movement between zones should be restricted to those that need access to a specific area, and entry and exit between zones should be through designated access control points. A description of the three work-zone system for hazardous wastes is provided below.

**Exclusion Zone** – The exclusion zone should include any area where contamination is known or suspected. Areas of air, water, or soil that are contaminated with hazardous

materials (biohazards, radioactive materials, chemicals) should be included in the exclusion zone. The zone should be well known to site workers. On smaller projects, this can be a verbal identification to site workers, such as “A 20-foot radius around the drill rig”. On larger projects, or in areas that may be encountered by observers or the general public, the zone may need to be defined with caution tape, traffic cones or in some instances, fencing and barriers. The need will be site specific and the specific method should be identified in the site-specific health and safety plan. Some work practices that should be followed in the exclusion zone include:

- Employees in the exclusion zone must wear the PPE designated in the site health and safety plan for tasks executed within the zone.
- No eating, drinking, chewing gum or tobacco, smoking, application of cosmetics, including application of lip balm, sunscreen, or insect repellent is allowed in the exclusion zone.
- Sitting or kneeling in areas of high concentrations of contaminants should be avoided.
- If any PPE becomes defective, the employee should leave the work area via the designated egress area, decontaminate as needed, and replace the defective PPE before returning to work in the exclusion zone.
- Prescription drugs should not be used within the exclusion zone unless approved by CDM’s medical consultant. The use of illegal drugs or consumption of alcohol is prohibited.
- When leaving the exclusion zone, employees should exit via the designated access/egress point(s) and follow decontamination procedures described in the site health and safety plan.

**Contaminant Reduction Zone (CRZ)**– A CRZ is established to provide a transition between the exclusion zone and the support zone. The CRZ is set up at the access control points of the exclusion zone and will vary in size depending on the complexity of activities that need to occur within the zone. For small site investigations, the CRZ may simply be a designated area near containers set up to collect used disposable PPE and some soap and water. For larger projects, the CRZ may include specific decontamination points and be staffed by personnel specifically designated to participate in the decontamination of personnel and equipment exiting the exclusion zone. Depending on the site contaminants, level of contamination, and decontamination procedures, personnel in the CRZ may be required to wear protective clothing, gloves, or respirators. The specific requirements will be outlined in the site health and safety plan. The CRZ should be placed in an area that is not contaminated at the boundary of the exclusion zone.

**Support Zone** – The support zone is established near the entrance to the site and is far enough from the exclusion zone and CRZ that specialized protective clothing or respirators are not used. The use of normal field PPE such as hard hats, safety glasses, and safety work boots is expected except for areas such as office trailers, break and lunch areas, or other areas designated as having no known or anticipated hazards. Operational support activities and equipment storage and maintenance areas are located

in the support zone. No equipment or personnel should go from the exclusion zone to the support zone without passing through the CRZ and being decontaminated in accordance with the site health and safety plan.

**Mobile Work Zone** - For those projects that involve brief periods of work in multiple locations, a specific area may be designated as the exclusion zone for the duration of the work performed in that area. The exclusion zone can be terminated (provided there are no ongoing hazards or potential exposures to contaminants) and moved to the next area of work. For example, during soil borings or well installation, the exclusion zone can be defined as, "1.5 times the mast height" of the drill rig. Once the boring has been closed, or well installed and secured, and all drill cuttings have been secured, the area can be opened up and a new exclusion zone established around the next boring location.

### 16.20.2 Considerations When Establishing Work Zones

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Work zones should be large enough to perform tasks within the zone safely, with no exposure to hazards to personnel outside the zone, but they should also be small enough to be able to secure and control access. Some considerations in establishing work zones include:

- Physical and topographical features of the site.
- Dimensions of the contaminated area.
- Weather.
- Physical, chemical, and toxicological characteristics of contaminants and chemicals used in the zone.
- Potential for exposure to site contaminants.
- Known and estimated concentrations of contaminants.
- Air dispersion of contaminants.
- Fire and explosion potential.
- Planned operations and space needed to perform the work safely.
- Surrounding areas.
- Decontamination procedures.
- History of job site.

### 16.20.3 General Hazardous Waste Site Work Practices

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- **Buddy System** - Work should be scheduled so that no person works unobserved within the exclusion zone at any time. Each worker within the exclusion zone should maintain visual contact with at least one other worker on the site. All site personnel should remain aware of each other and monitor each other's condition.
- **Eating, drinking, chewing gum or tobacco, and smoking** - are prohibited within the contaminant reduction and exclusion zones. (Exception for heat stress: Squeeze bottles of water, Gatorade, or other fluids may be consumed via squeeze bottles in the

contaminant reduction zone with the approval of the health and safety manager. Open bottles, cups, etc. should not be permitted.)

- Sitting or kneeling should be avoided in areas of known or suspected areas of contamination.
- Hands and face should be thoroughly washed when leaving the work area.
- Defective PPE should be repaired or replaced immediately.

Sections 5,6, 7, 9, and 11 of this manual are particularly in applicable to health and safety at hazardous waste sites.



## **16.21 Decontamination at Hazardous Waste Sites**

Proper decontamination helps protect employees and prevents the contamination of uncontaminated areas. Decontamination protects all site personnel by minimizing the transfer of harmful materials into clean areas. It helps prevent mixing of incompatible chemicals and protects the community by preventing uncontrolled transportation of contaminants from the site.

### **16.21.1 Prevention of Contamination**

To prevent contamination, Crew members should:

- Follow procedures for proper dressing prior to entry into the exclusion zone. Proper dressing will minimize the potential for contaminants to bypass the PPE and escape decontamination.
- Protect monitoring and sampling instruments by bagging. Make openings in the bags for sample ports and sensors that must contact site materials, or cover equipment and tools with a strippable coating, which can be removed during decontamination.
- Encase any source of contaminants on the site with barriers (e.g., plastic sheeting or over packs).
- Stress work practices that minimize contact with hazardous substances. Use remote sampling, handling, and container-opening techniques.

### **16.21.2 Decontamination Equipment Selection**

In selecting decontamination equipment, consider whether the equipment must be decontaminated for reuse or can be easily disposed of. Recommended equipment for decontamination includes:

- Storage tanks or appropriate treatment systems
- Drains or pumps
- Long-handled brushes
- Wash solutions appropriate for the contaminants present
- Rinse solutions appropriate for the contaminants present
- Pressurized sprayers for washing and rinsing
- Curtains, enclosures, or spray booths
- Long-handled rods and shovels
- Containers to hold contaminants and contaminated soils

- Wash and rinse buckets
- Brooms
- Containers for the storage and disposal of contaminated material

### **16.21.3 Decontamination Design**

Decontamination facilities should be located in the contamination reduction zone (CRZ), i.e., the area between the exclusion zone (the contaminated area) and the support zone (the clean area) and described in the Site H & S Plan.

- Site-specific factors that affect the decontamination facility design must be considered. Typical factors include:
  - The chemical, physical, and toxicological properties of the wastes.
  - The pathogenicity of infectious wastes.
  - The amount, location, and containment of contaminants.
  - The potential for, and location of, exposure based on assigned worker duties, activities, and functions.
  - The potential for wastes to permeate, degrade, or penetrate materials used for personal protective clothing and equipment, vehicles, tools, buildings, and structures.
  - The proximity of incompatible wastes.
  - The movement of personnel and/or equipment among different zones.
  - The emergencies that may arise.
  - The methods available for protecting workers during decontamination.
  - The impact of the decontamination process and compounds on worker health and safety.
- Decontamination Line
  - Decontamination should be an organized process by which levels of contamination are reduced.
  - The decontamination process consists of a series of steps performed in a specific sequence. For example, outer, more heavily contaminated items are decontaminated first, followed by the decontamination and removal of inner, less contaminated items.

- Each step should be performed at separate stations to prevent cross contamination.
- Decontamination stations should allow enough separation to prevent cross contamination and should be arranged in order of decreasing contamination.
- Separate decontamination areas should be provided to isolate workers from different contamination zones containing incompatible wastes or decontamination processes.
- Entry and exit points should be conspicuously marked. Preferably the entry to the CRZ from the exclusion zone should be separate from the entry to the exclusion zone from the CRZ.
- Dress-out stations for entry to the CRZ should be separate from redressing areas for exit from the CRZ.
- Personnel who wish to enter clean areas of the decontamination facility, such as locker rooms, must be appropriately decontaminated first.
- Examples of decontamination lines and procedures for personnel wearing various levels of protection are provided in Exhibits 16A and B.

#### **16.21.4 PPE for Decontamination Workers**

A rule of thumb is that decontamination workers wear a level of protection one level below the level of protection worn in the exclusion zone. However, consideration should be given to the following when determining the level of protection for a given project.

- The nature of site contamination.
- Degree of contamination expected on workers leaving the exclusion zone.
- The results of wipe tests and onsite air monitoring.

Some site-specific cases may require that decontamination personnel wear the same level of PPE as workers in the exclusion zone. Cases include:

- Workers using a steam jet may need a different type of respiratory protection than other decontamination personnel because of the high moisture content of the steam jets.
- Cleaning solutions used and wastes removed during decontamination may generate harmful vapors, requiring a different type of respiratory or clothing protection.

### 16.21.5 Decontamination Methods

All personnel, clothing, equipment, and samples leaving the contaminated area of a site should be decontaminated to remove any harmful chemicals, radioactive material, or infectious organisms that may have adhered to them. The extent of decontamination will vary depending on the nature of site activity, site contamination, and other factors.

- Decontamination methods available include:
  - Physical removal
  - Chemical detoxification or disinfections/sterilization.
  - A combination of both physical and chemical methods.
- The selected decontamination method should be reviewed for any safety and health hazards. If the selected method poses a direct health hazard, measures shall be taken to protect both the decontamination personnel and the workers to be decontaminated.
- Physical Removal
  - Physical methods using high pressure and/or heat should be used with caution.
  - Loose contaminants can be removed by using a soap and water rinse with a soft bristle brush to remove dust and vapors that cling to equipment and workers, or that are trapped in small openings, such as clothing or fabric weaving.
- Adhering contaminants can be removed by:
  - Scraping, brushing and wiping.
  - Solidifying.
  - Freezing (using dry ice or ice water).
  - Adsorption or absorption (e.g., kitty litter or powdered lime).
  - Melting.
  - Volatile liquid contaminants can be removed from PPE or equipment by evaporation followed by a water rinse. Evaporation may be expedited by the use of steam jets.

- Chemical Removal
  - Decontamination using chemicals should only be done if recommended by an industrial hygienist or other qualified professional.
  - Any chemical used in the decontamination process must be chemically compatible with the equipment or clothing being decontaminated.
  - Halogenated solvents should only be used for decontamination in extreme cases where other cleaning agents will not remove the contaminant.
- Chemical removal types include the following:
  - Surface contaminants can be dissolved in a solvent.
  - Solidification of liquid or gel contaminants can enhance their physical removal. Typical solidification processes are moisture removal using adsorbents such as grounded clay or powdered lime; and chemical reactions using polymerization chemicals and/or chemical reagents.

### **16.21.6 Personnel Decontamination**

Different levels of personnel protection, as discussed in the PPE guidelines, may be used at any given site. The following is a description of the decontamination process for each level of protection.

- Level D
  - An area should be designated for the gross removal of dirt and mud from gloves and boot covers. Paper towels and buckets of rinse water can be made available for this purpose.
  - Typical decontamination steps for level D operations are provided in Exhibit 16-A.
  - Soap and water should be used to wash hands and face before leaving the site.
  - Laundering of personal clothing should be completed as soon as possible once offsite.
- Level C & B
  - A decontamination line should be established.
  - Site-specific procedures should be outlined in the site H&S plan. The recommended procedure for this layout is listed in Exhibit 16-B.

- **Level A** -It is not anticipated Camp Dresser & McKee Inc. (CDM) will directly participate in level A operations. If required, site-specific procedures will be developed in coordination with the division H&S manager.

### **16.21.7 Sampling and Monitoring Equipment Decontamination**

Sampling equipment often becomes grossly contaminated. Often trowels or drum thieves are dedicated to a particular site. These should be left in the exclusion zone and disposed of as contaminated waste at the end of site work. Sampling equipment such as split spoons or other equipment that is used to collect several samples must be cleaned and decontaminated between samples to prevent cross contamination. These items should be cleaned and decontaminated in the project operations or sampling plan. Dirt and wash solutions from sampling equipment decontamination should be collected and disposed of as investigation-derived waste.

Once grossly contaminated, testing and monitoring instrumentation can be difficult to decontaminate without causing damage to the instrument. Care should be taken in the field to prevent gross contamination of field instruments by avoiding direct contact between the instrument and contaminated soils, water or surfaces. In some cases it may be necessary to place instruments in plastic bags, leaving small openings for sampling ports, detectors, and exhaust ports. The plastic bags can then be removed as the instrument comes out of the exclusion zone. The outside of instruments can be wiped down with paper towels or brushed off with clean soft brushes.

### **16.21.8 Heavy Equipment Decontamination**

Drill rigs, trucks, backhoes, and other heavy equipment can be difficult to decontaminate. The method generally used is to wash them with water under pressure and scrub accessible areas with soap and warm water. Hot water and steam systems can be effective but may increase air concentrations of contaminants, exposing decon workers. Particular care should be taken where equipment comes into direct contact with contaminated soils such as tires, buckets, or treads. In severe cases, tires may need to be replaced or parts sand blasted clean or disposed of. Equipment should be visually inspected to be sure it is free of any visible signs of contamination. In some cases, wipe tests or other methods may be needed to confirm equipment has been adequately decontaminated before leaving the site.

### **16.21.9 Decon Solutions, Disposable PPE, and Site Wastes**

Potentially contaminated equipment, disposable PPE, respirator cartridges, disposable sampling equipment, brushes, buckets, waste decon solutions etc., should be secured in drums and labeled. Disposal methods for these materials may depend on client requirements and/or results of site investigation data. The confirmed presence of hazardous materials on the site may require disposal of investigation-derived wastes as hazardous wastes.

Care should be taken during work and decontamination activities to minimize waste materials generated.

## Exhibit 16-A Minimum Measures For Level D Decontamination

<u>Station 1 - Equipment Drop</u>	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
<u>Station 2 - Outer Garment, Boots, and Gloves Wash and Rinse</u>	Scrub outer boots, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
<u>Station 3 - Hard Hat, Outer Boot, and Glove Removal</u>	Remove hard hat, outer boots and gloves.
<u>Station 4 - Boots, Gloves, and Outer Garment Removal</u>	Remove boots, suit, and inner gloves and deposit in separate containers lined with plastic.
<u>Station 5 - Field Wash</u>	Wash hands and face.



## Exhibit 16-B Minimum Measures For Level B, And C Decontamination

<u>Station 1 - Equipment Drop</u>	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
<u>Station 2 - Outer Garment, Hard Hat, Boots, and Gloves Wash and Rinse</u>	Scrub outer boots, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
<u>Station 3 - Tank/Air Canister Change</u>	If a worker leaves the exclusion zone to change an air tank, air canister, or mask, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boots donned, and joints tapped. Worker returns to duty.
<u>Station 4 - Hard Hat, Outer Boot, and Glove Removal</u>	Remove outer boots and gloves. Deposit in container with plastic liner.
<u>Station 5 - Inner Gloves and Outer Garment Removal</u>	Remove suit, and inner gloves and deposit in separate containers lined with plastic.
<u>Station 6 -SCBA/Respirator Removal</u>	SCBA backpack and face-piece/respirator is removed (avoid touching face with fingers). SCBA or respirator is deposited on plastic sheets.
<u>Station 7 - Field Wash</u>	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face.

## 16.22 Traffic and Work Zone Safety

These guidelines apply whenever Camp Dresser & McKee Inc. (CDM) employees or subcontractors work in areas exposed to vehicular traffic on public streets or highways.

- Where vehicular traffic hazards exist because of work at locations near public streets or roads, a system of traffic and work zone controls should be developed to mitigate the hazard. The system should meet the requirements of Part 6 of the Manual of Uniform Traffic Control Devices published by the Federal Highway Administration, or the applicable state version of the MUTCD.
- In general, when the MUTCD allows to use of traffic safety direction devices, like cones, CDM will supplement those direct and devices with a physical barrier, like a truck.
- All traffic control systems on public roads must be coordinated with local traffic control officials as required by applicable law.
- Periodically evaluate effectiveness of temporary traffic control set ups by walking or riding the job area looking for evidence of poor controls and near misses such as swerving traffic, motorists braking quickly, skid marks, blind spots, etc.
- Give motorists plenty of advanced warning of upcoming work zones.
- All employees working within designated work zones or near vehicular traffic should wear high visibility clothing such as orange, yellow or yellow-green shirts, jackets or vests. During wet or inclement weather similarly colored rainwear should be worn.
- During night work, between the hours of sunset and sunrise, high visibility clothing should incorporate reflective striping or fabric and be visible at a distance of 1,000 feet. This clothing should meet ANSI standard #107 for High Visibility Safety Apparel.
- All employees working near traffic and vehicles must maintain situational awareness at all times. Stay mindful that warning signs and cones, inform drivers to take action, but that some may not pay attention and vehicles may still enter the work zone.

## 16.24 Cell Phone Safety

### 16.24.1 Cell Phone Use and Driving

The National Highway Traffic Safety Administration (NHTSA) published a report in 2001 titled *An Investigation of the Safety Implications of Wireless Communications in Vehicles*. Based on the NHTSA report, the following guidelines should be followed when using your cell phone in a vehicle:

- Minimize the use of cell phones while driving. To the extent possible, place calls ahead of time while in the office, home, or if on the road, at a location where you can safely pull off the road.
- If you receive an incoming call, let your voice mail answer it and call the person back after you have stopped the vehicle at a safe location.
- If you must use your phone while driving, use hands-free systems and get to know the features such as auto-redial, speed dial, and voice-activated dialing.
- Engage in short conversations. If lengthy discussions are required, suspend the conversation and find a safe place to stop before continuing the discussion.
- Do not take notes while talking on the phone and driving. (This may seem silly, but was not an uncommon observation made by the authors of the NHTSA report.)

Some of the findings in the NHTSA report are summarized below:

- The use of cell phones while driving increases the risk of an accident.
- Contributing factors included distractions while dialing, being startled when the cell phone rang, and the act of engaging in conversation.
- The most significant factor was the act of conversation. The implication of this is that hands-free systems do not mitigate the biggest hazard associated with the use of cell phones while driving.
- Dialing the cell phone, while a distraction, was similar to the distraction potential of manually tuning a car radio.
- There is currently insufficient data to determine the magnitude of the problem because of the inconsistency of reporting accident causes.
- The presence of cell phones in vehicles enhances the notification of emergency services when needed.
- While cellular telephones clearly have distraction potential from many standpoints, such effects may be minimized if drivers are aware of the hazards, are judicious in their use of the technology, and if ergonomically sound cellular telephone designs are used.
- Eighty-five percent of cell phone users use their cell phones while driving.
- Many cities and states either have passed or are considering legislation to regulate cell phone use while driving.

Additional information related to cell phone H&S can be found at the following websites:

[www.nhtsa.dot.gov/people/injury/research/wireless](http://www.nhtsa.dot.gov/people/injury/research/wireless)

[www.nejm.org/content/2001/0344/0002/0133.asp](http://www.nejm.org/content/2001/0344/0002/0133.asp)

[www.fda.gov/cdrh/ocd/mobilephone.html](http://www.fda.gov/cdrh/ocd/mobilephone.html)

## 16.24.2 Radio Frequency Radiation

Some of the information related to radio frequency exposure and cell phone use available from recognized peer reviewed journals and government agencies are listed below:

- Numerous studies looking at the use of hand-held cell phones and risk of brain cancer have indicated no association between the use of cell phones and risk of brain cancer. This includes the two most recent studies published in the Journal of the American Medical Association (AMA) and the New England Journal of Medicine (NEJM), which are among the most comprehensive undertaken as of January 2001.
- Some of the studies conducted have indicated there are biological effects associated with exposure to the types and levels of radio frequency radiation associated with cell phone use; however, there is no consensus that these effects are harmful to people.
- An editorial published in the NEJM referencing a study published in its January 2001 issue concluded, "This study allays fears raised by alarmist reports that the use of cellular phones causes brain tumors. Of course, we do not have the final word on this question, and results of future investigations may modify our perspective. Nevertheless, we believe that it is highly unlikely that the use of cellular telephones substantially increases the risk of brain tumors."

Based on the information currently available, there is not a significant health hazard associated with radio frequency radiation exposure related to cell phones. Suggestions for limiting radio frequency radiation exposure related to cellular telephone use have been published by the Food and Drug Administration (FDA) and are listed below:

- Limit cell phone use. Where possible, hold lengthy conversations on conventional phones and use cell phones for short conversations and for situations when conventional phones are not available.
- When using a mobile phone or a cell phone in a vehicle, connect it to an antenna located outside the vehicle.
- Use a "hands free" headset and a remote antenna with the cell phone carried at the waist.
- Use a cell phone with a low specific absorption rate (SAR) as published by the Federal Communications Commission (FCC).

The FCC has published a list of SAR values for almost all cell phone models manufactured since 2000. The SAR is a measure of the amount of radio frequency radiation absorbed under certain test conditions. This information is available at [www.fcc.gov/oet/rfsafety/](http://www.fcc.gov/oet/rfsafety/).

# **Attachment C**

## **Material Safety Data Sheets (MSDSs)**

# JRW BIOREMEDIATION LLC

MSDS - Whey Powder  
Issued January 19, 2007

## Section 1. Product Information

Name: Whey Powder

Material Use: Food stuff

JRW Bioremediation, LLC  
24 Emergency Telephone 913-438-5544

## Section 2. Hazardous Ingredients

Not applicable

## Section 3. Physical Data

Physical State: Solid

Vapor Pressure (mm Ag): Not applicable

Boiling Point: Not applicable

Odor & Appearance: Typical of Whey Powder

Vapor Density (air=1): Not applicable

Freezing Point: 0oC

Density: Approx. 775 g/l

Evaporation Rate: Not applicable

Solubility in Water: Soluble

## Section 4. Fire and Explosion Hazard

Non Flammable

Means of Extinction: Foam, CO2, Dry chemicals or water

Flash Point: Not less than 250oC

Explosion Data: Not applicable

## Section 5. Reactivity Data

Chemical Stability: Product is stable

Reactivity: Not applicable

## Section 6. Toxicological Properties

Routes of Entry: Ingestion, Inhalation, Skin, Eyes

Effects of Acute Exposure to Product (Allergen):

This product contains lactose, as such those who are lactose intolerant may experience some discomfort and some digestive problems associated with this conditions; acuteness

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Tel: 913-438-5544 • Fax: 913-438-5554 • 14321 West 96th Terrace, Lenexa, KS 66215  
info@jrwbiorem.com • <http://www.jrwbioremediation.com>

# JRW BIOREMEDIATION LLC

of discomfort or problem varies with each individual. In addition, those who are allergic to milk proteins should be cautioned, as this product is a potential allergen due to presence of milk proteins.

Inhalation: Dust irritation, respiratory ailments may be aggravated by dust (allergen)

Skin Contact: Dust irritation

Eye Contact: Dust irritation

## Effects of Chronic Exposure to Product

No evidence of adverse effect from available information

LD50: Unknown

LC50: Unknown

Irritancy of product:

Sensitization of Product: None

## Section 7. Preventive Measures

### Personal Protective Equipment

As recommended by the Good Manufacturing Practices of the user.

Gloves: PVC or rubber

Clothing: Good manufacturing practices

Respiratory: Dust mask

Eye: Safety glasses

Footwear: Safety shoes

Engineering Controls: Not applicable

## Leak and Spill Procedures

Sweep up or shovel up and dispose of in a suitable container. Clean area with detergent and rinse.

Waste Disposal: In accordance with local, provincial, state and federal regulations

Handling Procedures & Equipment: Not applicable

Storage Requirements: Keep away from heat source, store in cool storage (20°C/68°F) with a relative humidity of less than 50%. Avoid storing near strong smelling products.

## Section 8. First Aid Measures

Skin: Wash with soap and water and rinse with water

Eye: Rinse with water, see physician if necessary

Inhalation: Not applicable

Ingestion: Do not provoke vomiting. See physician if necessary

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info@jrwbiorem.com • <http://www.jrwbioremediation.com>

MSDS Number: S4226 \* \* \* \* \* Effective Date: 05/06/05 \* \* \* \* \* Supercedes: 04/15/02



## Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.  
222 Red School Lane  
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151  
CHEMTREC: 1-800-424-9300

National Response in Canada  
CANUTEC: 613-996-6666

Outside U.S. And Canada  
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# Sodium Lactate (60% Syrup)

## 1. Product Identification

**Synonyms:** Lacolin; Lactic Acid, monosodium Salt; Propanioc acid, 2-hydroxy-, monosodium salt

**CAS No.:** 72-17-3

**Molecular Weight:** 112.07

**Chemical Formula:** C<sub>3</sub>H<sub>5</sub>O<sub>3</sub>Na

**Product Codes:** 2096, V034

## 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Lactate	72-17-3	60%	Yes
Water	7732-18-5	40%	No

## 3. Hazards Identification

### Emergency Overview



**CAUTION! MAY CAUSE EYE IRRITATION.**

**J.T. Baker SAF-T-DATA<sup>(tm)</sup>** Ratings (Provided here for your convenience)

---

Health Rating: 1 - Slight

Flammability Rating: 0 - None

Reactivity Rating: 0 - None

Contact Rating: 1 - Slight

Lab Protective Equip: GOGGLES; LAB COAT

Storage Color Code: Orange (General Storage)

---

**Potential Health Effects**

---

To the best of our knowledge, the toxicological properties of this material have not been thoroughly investigated.

**Inhalation:**

No adverse health effects expected from inhalation.

**Ingestion:**

Not expected to be a health hazard via ingestion.

**Skin Contact:**

Not expected to be a health hazard from skin exposure.

**Eye Contact:**

May cause mild irritation, possible reddening.

**Chronic Exposure:**

No information found.

**Aggravation of Pre-existing Conditions:**

No information found.

---

## 4. First Aid Measures

**Inhalation:**

Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.

**Ingestion:**

Not expected to require first aid measures. If large amounts were swallowed, give water to drink and get medical advice.

**Skin Contact:**

Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

---

## 5. Fire Fighting Measures

**Fire:**

Not considered to be a fire hazard.

**Explosion:**

Not considered to be an explosion hazard.

**Fire Extinguishing Media:**

Use any means suitable for extinguishing surrounding fire.

**Special Information:**

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

## 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

---

## 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Avoid long storage times. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

## 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**

None established.

**Ventilation System:**

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

**Personal Respirators (NIOSH Approved):**

For conditions of use where exposure to the substance is apparent and engineering controls are not feasible, consult an industrial hygienist. For emergencies, or instances where the

exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

**Skin Protection:**

Wear protective gloves and clean body-covering clothing.

**Eye Protection:**

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

## 9. Physical and Chemical Properties

**Appearance:**

Colorless to yellow liquid.

**Odor:**

Odorless.

**Solubility:**

Complete (100%)

**Specific Gravity:**

1.31

**pH:**

6.5 - 8.5

**% Volatiles by volume @ 21C (70F):**

No information found.

**Boiling Point:**

110C (230F)

**Melting Point:**

17C (63F)

**Vapor Density (Air=1):**

0.7

**Vapor Pressure (mm Hg):**

14 @ 20C (68F)

**Evaporation Rate (BuAc=1):**

No information found.

---

## 10. Stability and Reactivity

**Stability:**

Stable under ordinary conditions of use and storage.

**Hazardous Decomposition Products:**

Carbon dioxide and carbon monoxide may form when heated to decomposition.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

No information found.

**Conditions to Avoid:**

None.

---

## 11. Toxicological Information

Oral rat LD50: 2000 mg/Kg. Irritation Data for Sodium Lactate: (Std Draize, rabbit, eye):  
100 mg - mild.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Sodium Lactate (72-17-3)	No	No	None
Water (7732-18-5)	No	No	None

---

## 12. Ecological Information

### Environmental Fate:

Mobility: Completely soluble.

Persistence / degradability: Product is a salt of lactic acid, which is readily biodegradable.

Bioaccumulation: Unlikely.

Ecotoxicity: Ecological injuries are not known or expected under normal use; (No effect on Daphnia @ 10g/L).

### Environmental Toxicity:

No information found.

---

## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

## 14. Transport Information

Not regulated.

---

## 15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

Ingredient	TSCA	EC	Japan	Australia
Sodium Lactate (72-17-3)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	Korea	DSL	NDSL	Phil.
Sodium Lactate (72-17-3)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302- RQ	TPQ	-----SARA 313----- List	Chemical Catg.
Sodium Lactate (72-17-3)	No	No	No	No
Water (7732-18-5)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)
Sodium Lactate (72-17-3)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No      TSCA 12(b): No      CDTA: No  
 SARA 311/312: Acute: Yes      Chronic: No      Fire: No      Pressure: No  
 Reactivity: No      (Mixture / Liquid)

**Australian Hazchem Code:** None allocated.

**Poison Schedule:** None allocated.

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. Other Information

**NFPA Ratings:** Health: 1 Flammability: 0 Reactivity: 0

**Label Hazard Warning:**

CAUTION! MAY CAUSE EYE IRRITATION.

**Label Precautions:**

Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.

**Label First Aid:**

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes.

Get medical attention if irritation develops or persists.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

No Changes.

**Disclaimer:**

\*\*\*\*\*

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\*\*\*\*\*

**Prepared by:** Environmental Health & Safety

Phone Number: (314) 654-1600 (U.S.A.)

Remediation and Natural Attenuation Services Incorporated  
6712 West River Road  
Brooklyn Center, MN 55430

Product Information: 763-585-6191

Issue Date: March 28, 2002

### Section 1: IDENTIFICATION

- 1.1 Product Name: Newman Zone  
1.2 Product Type: Inedible Industrial Nutrient for Microbial Organisms  
1.3 Hazard Rating: Health: 1 Fire: 1 Reactivity: 1  
1.4 Formula: Proprietary

Substances Subject to SARA 313 Reporting Are Indicated by "#"

It is our opinion that the above named product does not meet the definition of "hazardous Chemical" as defined in the OSHA "Hazard Communication Standard" regulation 29 CFR 1910.1200. This material Safety Data Sheet is provided as general information for health and safety guidelines.

### Section 2: INGREDIENTS/COMPOSITION

	CAS No.	%	PEL	TWA
Soybean Oil (food grade)	8001-22-7	45	15 (Mist)	10 (Mist)
Sodium-L-Lactate	867-56-1	4		
Food Additives/Emulsifiers/Preservatives (Proprietary)		<10		
Water		<45		

EMERGENCY ONLY, 24-HOUR SERVICE: CHEMTREC: 1-800-424-9300

### Section 3: PHYSICAL AND CHEMICAL CHARACTERISTICS

This section completed per formulation ingredient data unless stated.

- Solubility: Dispersible in water (product)
- PH: 6 (product)
- Specific Gravity: 0.98 (product)
- Boiling Point: NA
- Vapor Pressure: NA
- Vapor Density: NA
- Percent Volatile By Volume (%): NA
- Evaporation Rate: NA
- Viscosity: 23.6 cps @ 68°F (Brookfield) (product)
- Product Appearance and Odor: Light yellow-cream colored liquid, vegetable oil odor.

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**Section 4: FIRE AND EXPLOSION HAZARDS**

This section completed per formulation ingredient data unless stated.

4.1 Special Fire Hazards: Product - none, does not support combustion.

Flash Point: >540 degrees F (Pure Soybean Oil Closed Cup).

Flammable Limits

LEL ND

UEL ND

4.2 Fire Fighting Methods: Use method appropriate for surrounding fire.

4.3 Extinguishing Media: Dry Chemical or CO<sub>2</sub> Preferable; water may cause spattering or spreading.

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**Section 5: HEALTH HAZARD DATA**

5.1 THIS PRODUCT IS NEITHER INTENDED NOR MANUFACTURED FOR HUMAN OR ANIMAL CONSUMPTION AND SHOULD NOT BE USED FOR FOOD OR FEEDSTUFFS.

5.2 Effects of Overexposure: NA

5.3 Emergency and First Aid Procedures: If inhaled, remove from contaminated atmosphere. For eye contact immediately flush eyes with large amounts of water. Ensure rinsing entire surface of eye & under lid. For skin contact wash affected areas thoroughly with soap and water. Seek medical help for persistent irritation.

5.4 Hydrolyzed soy protein has been identified by the United States Food and Drug Administration as a food allergen. Symptoms include swelling of the lips, stomach cramps, vomiting, diarrhea, skin hives, rashes, eczema and breathing problems.

5.5 Occupational Exposure Limits [8-hour time weighted averages (TWA)]:

	CAS No.	mg/m <sup>3</sup> OSHA PEL/ACGIH TLV
Soybean Oil (food grade)	8001-22-7	15 (Mist)/10 (Mist)

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**Section 6: REACTIVITY DATA**

This section completed per formulation ingredient data unless stated.

6.1 Stability: Stable under normal conditions.

6.2 Conditions to Avoid: NA

6.3 Incompatibilities: None known

6.4 Hazardous Decomposition Products: Product - None identified.  
Ingredients - Carbon oxides. Biological decomposition (spoilage) may result in offensive odors.

6.5 Hazardous Polymerization; None known



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**Section 7: SPILL OR LEAK PROCEDURES**

This section completed per formulation ingredient data unless stated.

- 7.1 Spill Response: Water dispersible. Same as for vegetable oil spills: isolate spill, prevent from entering waterways, and sewer systems. Sorb or remove spilled materials as soon as possible. Oils and specific quantities of oils may be reportable under federal, state, or local regulations.
- 7.2 Waste Disposal Method: This product is not hazardous, however, wastes must be disposed in accordance with local, state or federal regulations. Consult with local sewer authority, or solid waste facility prior to disposition.
- =====

**Section 8: SPECIAL PRECAUTIONS**

No protective equipment is necessary under normal use conditions.

- 8.1 Eyes: If splashing may occur, eye protection recommended.
- 8.3 Skin: Wear impervious gloves for prolonged or repeated exposure.
- 8.4 Respiratory: Avoid breathing mists of this product
- =====

**Section 9: TRANSPORTATION PRECAUTIONS**

This section completed per formulation ingredient data unless stated.

- 9.1 Transportation Considerations: This product is not classified as dangerous in the meaning of transport regulations. Shippers and transporters may need to meet packaging and transportation requirements for certain oils and respective quantities under CFR 49 Part 130.

The above information is believed to be correct with respect to the formula used to manufacture the product in the country of origin. As data, standards, and regulations change, and conditions of use and handling are beyond our control, NO WARRANTY, EXPRESS OR IMPLIED, IS MADE AS TO THE COMPLETENESS OR CONTINUING ACCURACY OF THIS INFORMATION.

# Material Safety Data Sheet

***Shaw Environmental, Inc.***

**17 PRINCESS ROAD**

**LAWRENCEVILLE, N.J. 08648**

**(609) 895-5340**

## SECTION 1 - MATERIAL IDENTIFICATION AND INFORMATION

Material Name: DHC microbial consortium (SDC-9) MSDS #: ENV 1033

Date Prepared: 10/06/2003

CAS #: N/A (Not Applicable)

Prepared By: Simon Vainberg

Formula #: N/A

Material Description: Non-hazardous, naturally occurring non-altered anaerobic microbes and enzymes in a water-based medium.

## SECTION 2 - INGREDIENTS

Components	%	OSHA PEL	ACGIH TLV	OTHER LIMITS
Non-Hazardous Ingredients	100	N/A	N/A	N/A

## SECTION 3 - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 100°C (water)

Specific Gravity (H<sub>2</sub>O = 1): 0.9 - 1.1

Vapor Pressure @ 25°C: 24 mm Hg (water)

Melting Point: 0°C (water)

Vapor Density: N/A

Evaporation Rate (H<sub>2</sub>O = 1): 0.9 - 1.1

Solubility in Water: Soluble

Water Reactive: No

pH: 6.0 - 8.0

Appearance and Odor: Murky, yellow water. Musty odor.

#### **SECTION 4 - FIRE AND EXPLOSION HAZARD DATA**

Flash Point: N/A

Flammable Limits: N/A

Extinguishing Media: Foam, carbon dioxide, water

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None

#### **SECTION 5 - REACTIVITY DATA**

Stability: Stable

Conditions to Avoid: None

Incompatibility (Materials to Avoid): Water-reactive materials

Hazardous Decomposition Byproducts: None

#### **SECTION 6 - HEALTH HAZARD DATA**

##### HEALTH EFFECTS

The effects of exposure to this material have not been determined. Safe handling of this material on a long-term basis will avoid any possible effect from repetitive acute exposures. Below are possible health effects based on information from similar materials. Individuals hyper allergic to enzymes or other related proteins should not handle.

Ingestion: Ingestion of large quantities may result in abdominal discomfort including nausea, vomiting, cramps, diarrhea, and fever.

Inhalation: Hypersensitive individuals may experience breathing difficulties after inhalation of aerosols.

Skin Absorption: N/A

Skin Contact: May cause skin irritation. Hypersensitive individuals may experience allergic reactions to enzymes.

Eye Contact: May cause eye irritation.

#### FIRST AID

Ingestion: Get medical attention if allergic symptoms develop (observe for 48 hours). Never give anything by mouth to an unconscious or convulsing person.

Inhalation: Get medical attention if allergic symptoms develop.

Skin Absorption: N/A

Skin Contact: Wash affected area with soap and water. Get medical attention if allergic symptoms develop.

Eye Contact: Flush eyes with plenty of water for at least 15 minutes using an eyewash fountain, if available. Get medical attention if irritation occurs.

**NOTE TO PHYSICIANS:** All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this material may have occurred.

#### **SECTION 7 - SPILL AND LEAK PROCEDURES**

Reportable quantities (in lbs of EPA Hazardous Substances): N/A

Steps to be taken in case of spill or release: No emergency results from spillage. However, spills should be cleaned up promptly. All personnel involved in the cleanup must wear protective clothing and avoid skin contact. Absorb spilled material or vacuum into a container. After clean-up, disinfect all cleaning materials and storage containers that come in contact with the spilled liquid.

Waste Disposal Method: No special disposal methods are required. The material may be sewered, and is compatible with all known biological treatment methods. To reduce odors and permanently inactivate microorganisms, mix 100 parts (by volume) of DHC consortium with 1 part (by volume) of bleach. Dispose of in accordance with local, state and federal regulations.

## **SECTION 8 - HANDLING AND STORAGE**

Hand Protection: Rubber gloves.

Eye Protection: Safety goggles with side splash shields.

Protective Clothing: Use adequate clothing to prevent skin contact.

Respiratory Protection: Surgical mask.

Ventilation: Provide adequate ventilation to remove odors.

Storage & Handling:

Material may be stored for up to 3 weeks at 2-4°C without aeration.

Other Precautions: An eyewash station in the work area is recommended.

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While the information and recommendations set forth herein are believed to be accurate as of the date hereof, Shaw Environmental, Inc. MAKES NO WARRANTY WITH RESPECT HERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.



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## **KB-1™ Dechlorinator Material Safety Data Sheet**

### **Section 1: Material Identification**

**Trade Name:** KB-1™ Dechlorinator

**Chemical Family:** bacterial mixture

**Chemical name:** No IUC name for mixture is known to exist

**Manufacturer/Supplier:** SiREM  
.130 Research Lane, Suite 2,  
Guelph, Ontario,  
Canada N1G 5G3

**For Information call:** 519-822-2265 / 1-866-251-1747

**Emergency Number:** 519-822-2265

**Description:** Microbial inoculum (non-pathogenic, non-hazardous)

**Trade Name:** KB-1™ Dechlorinator

**Product Use:** Bioremediation of contaminated groundwater.

**Date Prepared:** 2 February 2005

### **Section 2: Composition, Information on Ingredients**

KB-1™ Dechlorinator is a microbial culture grown in an aqueous dilute mineral salt solution media containing no hazardous ingredients.

The microbial composition of KB-1™ Dechlorinator (as determined by phylogenetic analysis) is listed in Table 1. Identification of organisms was obtained by matching 16S rRNA gene sequence of organisms in KB-1™ Dechlorinator to other known organisms. The characteristics of related organisms can be used to identify potential or likely characteristics of organisms in KB-1™ Dechlorinator.

**Table 1. Genus' identified in KB-1™ Dechlorinator Microbial Inoculum**

<b>Genus</b>
<i>Dehalococcoides</i> sp.
<i>Geobacter</i> sp.
<i>Methanomethylovorans</i> sp.

### **Section 3: Hazards Identification:**

A review of the available data does not indicate any known health effects related to normal use of this product.

### **Section 4: First Aid Measures:**

Avoid direct contact with skin and eyes. In any case of any exposure which elicits a response, a physician should be consulted immediately.



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**Eye Contact:** Flush eyes with water for at least 15 minutes, occasionally lift upper and lower eyelids, if undue irritation or redness occurs seek medical attention.

**Skin Contact:** Remove contaminated clothing and wash skin thoroughly with water and antibacterial soap. Seek medical attention if irritation develops or open wounds are present.

**Ingestion:** Do not induce vomiting, drink several cups of water, seek medical attention.

**Inhalation:** Remove to fresh air. If not breathing give artificial respiration. In case of labored breathing give oxygen. Call a physician.

#### **Section 5 - Fire Fighting Measures:**

Non-flammable

Flash Point: not applicable

Upper flammable limit: not applicable

Lower flammable limit: not applicable

#### **Section 6 – Accidental Release Procedures**

Spilled KB-1™ Dechlorinator should be soaked up with sorbant and saturated with a 10% bleach solution (prepared by making a one in ten dilution of diluted standard bleach [normally sold at a strength of 5.25% sodium hypochlorite] to disinfect affected surfaces. Sorbant should be double bagged and disposed of as indicated in section 12. After removal of sorbant, area should be washed with 10% bleach solution to disinfect. If liquid from the culture vessel is present on the fittings, non-designated tubing or exterior of the stainless steel pressure vessel liquid should be wiped off and the area washed with 10% bleach solution.

#### **Section 7 - Handling and Storage**

KB-1™ Dechlorinator is shipped in stainless steel pressure vessels and connected to injection lines and inert gas is used to pressurize the vessel to displace the contents. KB-1™ Dechlorinator should be handled with care to avoid any spillage. Vessels are shipped with 1 pound per square inch (psi) pressure; valves should not be opened until connections to appropriate lines for subsurface injection are in place.

**Storage Requirements:** Avoid exposing stainless steel pressure vessels to undue temperature extremes (i.e., temperatures less than 0°C or greater than 30°C may result in harm to the microbial cultures and damage to the vessels). All valves should be in the closed position when the vessel is not pressurized to prevent the escape of gases and to maintain anaerobic conditions in the vessel. Avoid exposure of the culture to air as the presence of oxygen will kill dechlorinating microorganisms.

#### **Section 8 - Exposure Controls/Personal Protection**

##### **Personal protective equipment:**

Skin: Protective gloves (latex, vinyl or nitrile) should be worn.

Eye Protection: Wear appropriate protective eyeglasses or goggles when opening pressure vessels valves or when pressurizing vessels to inject contents into the subsurface.

Respiratory: No respiratory protection is required.

Engineering Controls: Good general room ventilation is expected to be adequate.



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### **Section 9: Physical and Chemical Properties:**

Physical State: liquid  
 Odour: skunky odour  
 Appearance: dark grey, slightly turbid liquid under anaerobic conditions, pink if exposed to air (oxygen).  
 Specific gravity: not determined  
 Vapor pressure: not applicable  
 Vapor density: not applicable  
 Evaporation rate: not determined  
 Boiling point: ~100° C  
 Freezing point/melting point: ~ 0°C  
 pH: 6.5-7.5  
 Solubility: fully soluble in water

### **Section 10 – Stability and Reactivity Data**

Stable and non-reactive.  
 Maintain under anaerobic conditions to preserve product integrity.  
 Materials to avoid: none known

### **Section 11 - Toxicological Information**

Potential for Pathogenicity:

KB-1™ Dechlorinator has tested negative (i.e., the organisms are not present) for a variety of pathogenic organisms listed in Table 2. While there is no evidence that virulent pathogenic organisms are present in KB-1™ Dechlorinator, there is potential that certain organisms in KB-1™ Dechlorinator may have the potential to act as opportunistic (mild) pathogens, particularly in individuals with open wounds and/or compromised immune systems. For this reason standard hygienic procedures such as hand washing after use should be observed.

**Table 2, Results of Human Pathogen Screening of KB-1™ Dechlorinator**

<b>Organism</b>	<b>Disease(s) Caused</b>	<b>Test result</b>
<i>Salmonella</i> sp.	Typhoid fever, gastroenteritis	Not Detected
<i>Listeria monocytogenes</i>	Listerioses	Not Detected
<i>Vibrio</i> sp.,	Cholera, gastroenteritis	Not Detected
<i>Campylobacter</i> sp.,	Bacterial diarrhea	Not Detected
<i>Clostridia</i> sp.,	Food poisoning, Botulism, tetanus, gas gangrene	Not Detected
<i>Bacillus anthracis</i>	Anthrax	Not Detected
<i>Pseudomonas aeruginosa</i>	Wound infection	Not Detected
<i>Yersinia</i> sp.,	Bubonic Plague, intestinal infection	Not Detected
Yeast and Mold	Candidiasis, Yeast infection etc.	Not Detected
Fecal coliforms	Indicator organisms for many human pathogens diarrhea, urinary tract infections	Not Detected
<i>Enterococci</i>	Various opportunistic infections	Not Detected





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#### **Section 12. Disposal Considerations**

Material must be disinfected or sterilized prior to disposal. Consult local regulations prior to disposal.

#### **Section 13 – Transport Information**

Non-hazardous, non-pathogenic microbial inoculum – Biosafety Risk Group 1.

Chemicals, Not Otherwise Indexed (NOI), Non-hazardous

Not subject to TDG or DOT guidelines.

#### **Disclaimer:**

The information provided on the MSDS sheet is based on current data and represents our opinion based on the current standard of practice as to the proper use and handling of this product under normal, reasonably foreseeable conditions.

Last revised: 3 February 2005